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ELECTRICAL REVIEW

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* Enables voltage regulation to be suited to system requirements.
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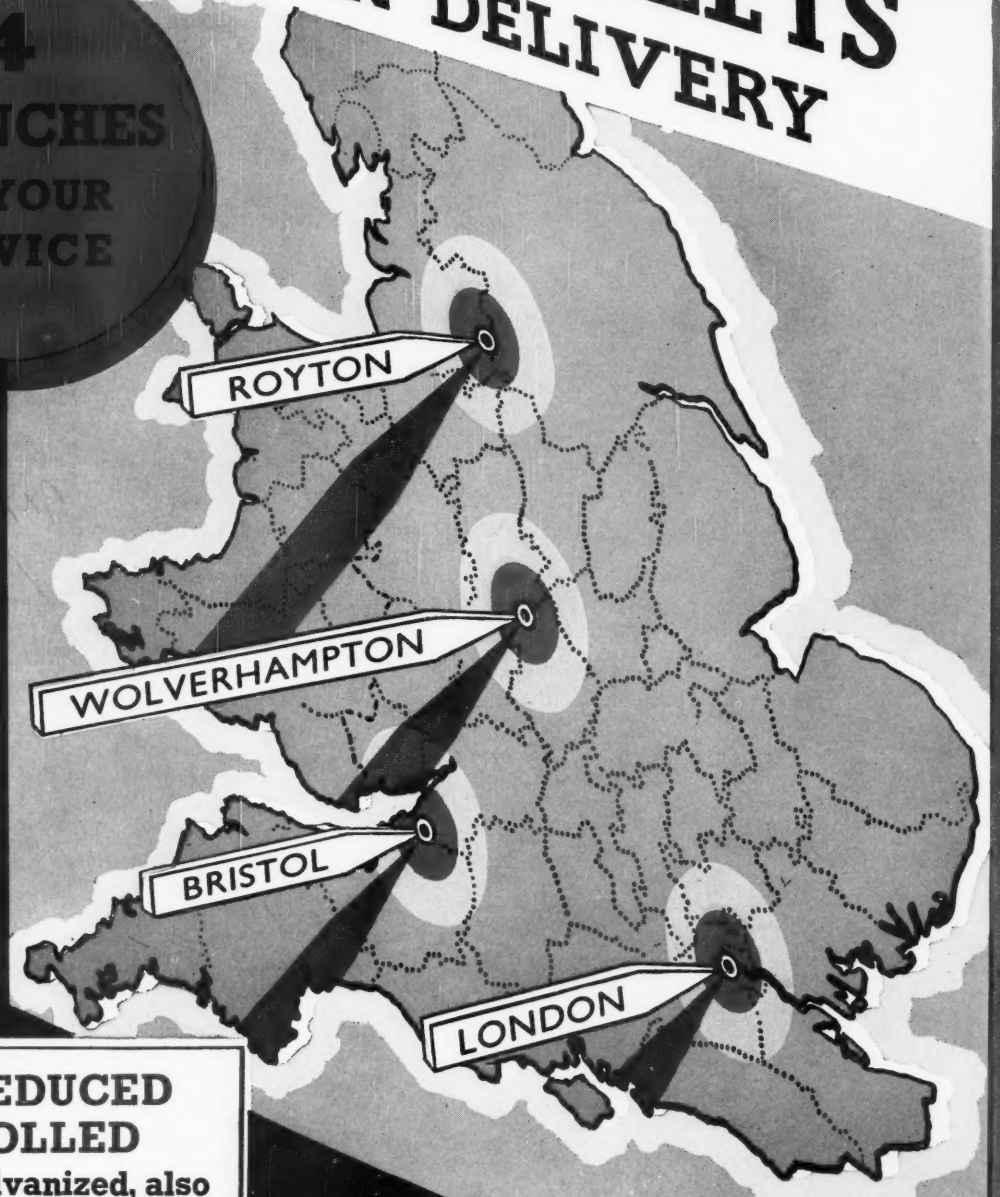

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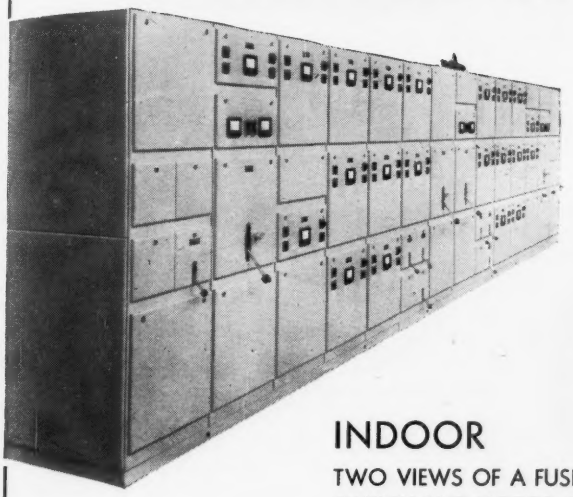

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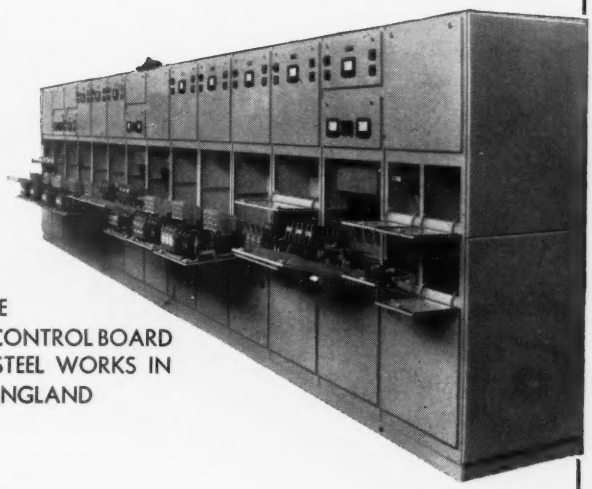

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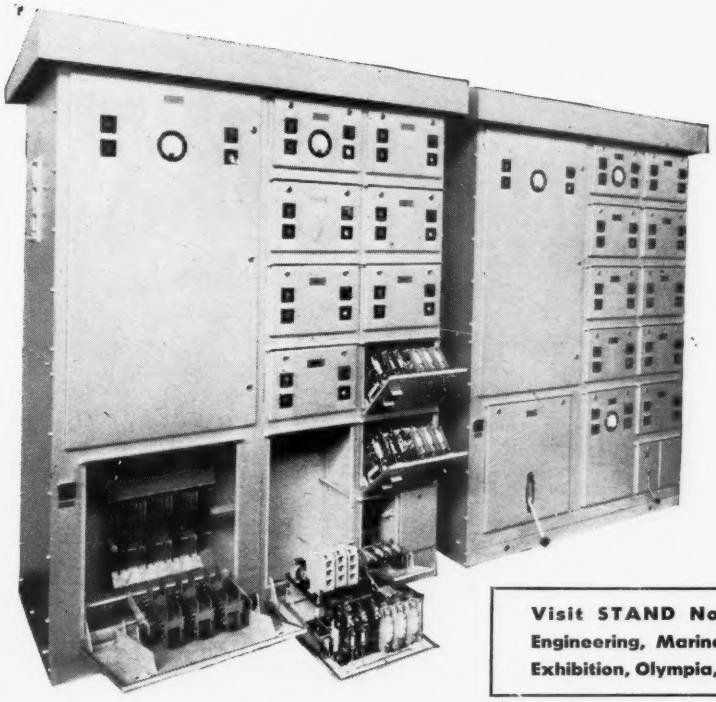
TWO VIEWS OF A FUSE SWITCH AND MOTOR CONTROL BOARD FOR AN IMPORTANT STEEL WORKS IN THE NORTH EAST OF ENGLAND



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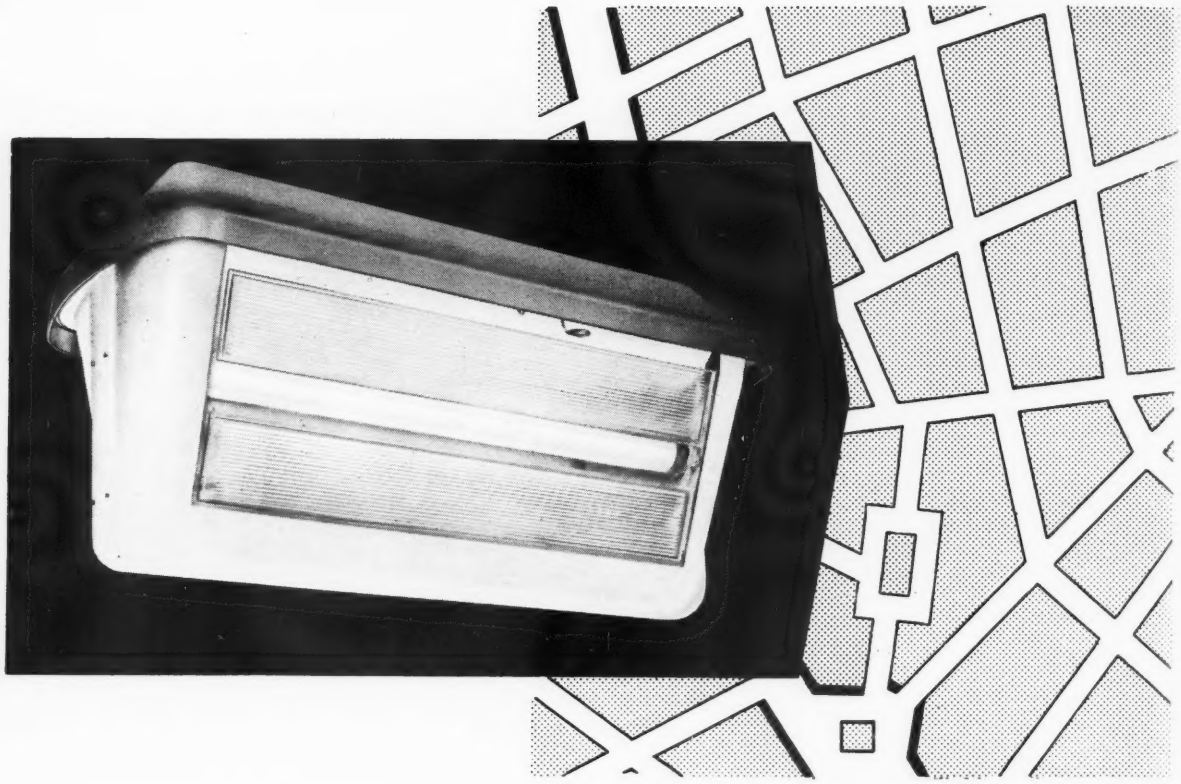

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for SIDE ROAD lighting

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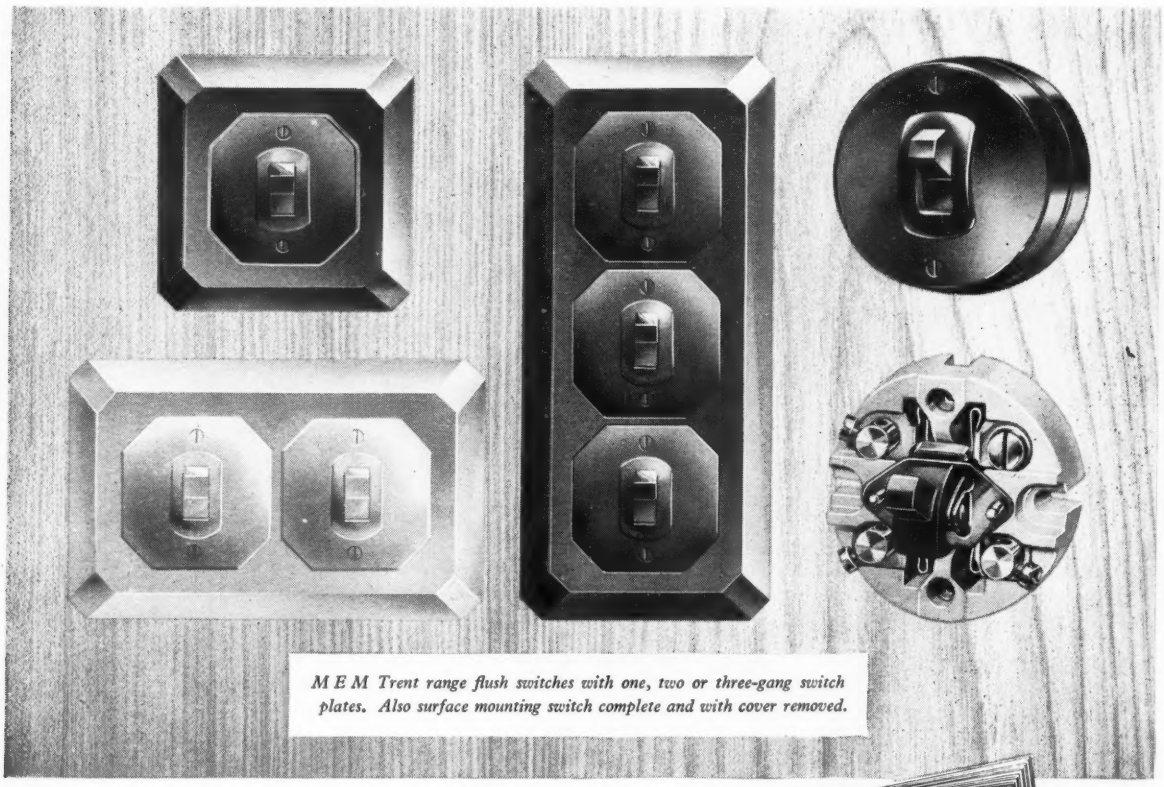

M E M Trent range flush switches with one, two or three-gang switch plates. Also surface mounting switch complete and with cover removed.

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- Quick make and break action suitable for AC/DC applications.
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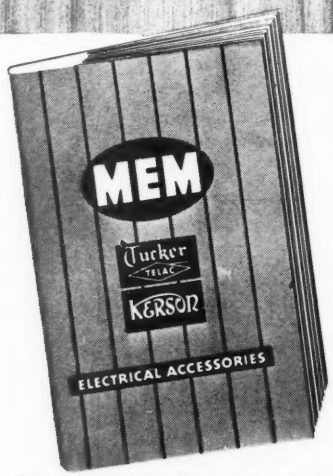
- All current carrying parts are mounted on high grade vitreous porcelain.
- Switch plates for flush switches for one, two, three and four-gang.



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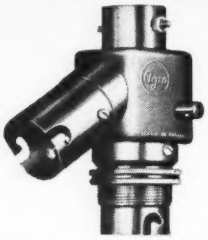

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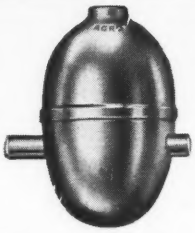
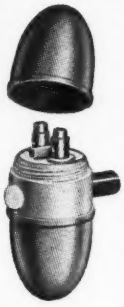


No. 7310 — Suspension Switch (brown or white bakelite). Combined 1-way and 2-way.



No. 7317 — Torpedo Switch. Two terminals at each end.

Cream throughout or cream body with pink end caps or cream body with green end caps.

No. 8100 — Door Switch. "Push to break" or "push to make." Flush and surface types.

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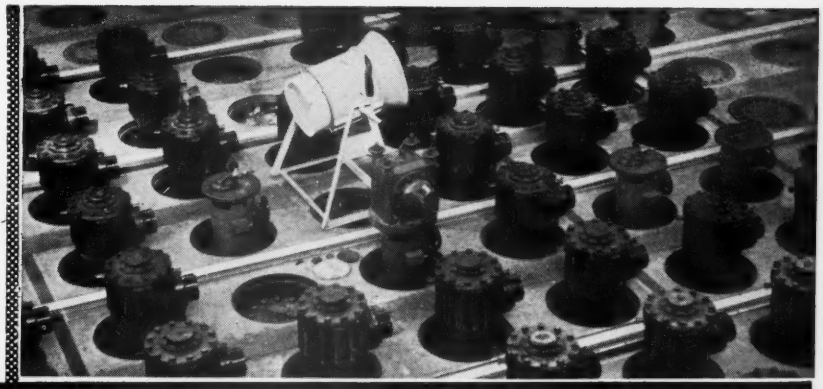
Silicone insulated motors drive the vital control rod-actuating mechanism of the reactors at Calder Hall, Britain's first atomic power station. There are sixty silicone insulated Metropolitan-Vickers motors for each reactor charging face, as illustrated.



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–AND SAFER. Silicone insulated dry-type transformers offer a safer alternative to oil-filled units.

One of the motors is shown before winding. The following silicone insulation components are employed:

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SLOT LINERS – *Silicone-bonded mica backed with glasscloth.*
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Photograph by courtesy of Metropolitan-Vickers Electrical Co. Ltd.

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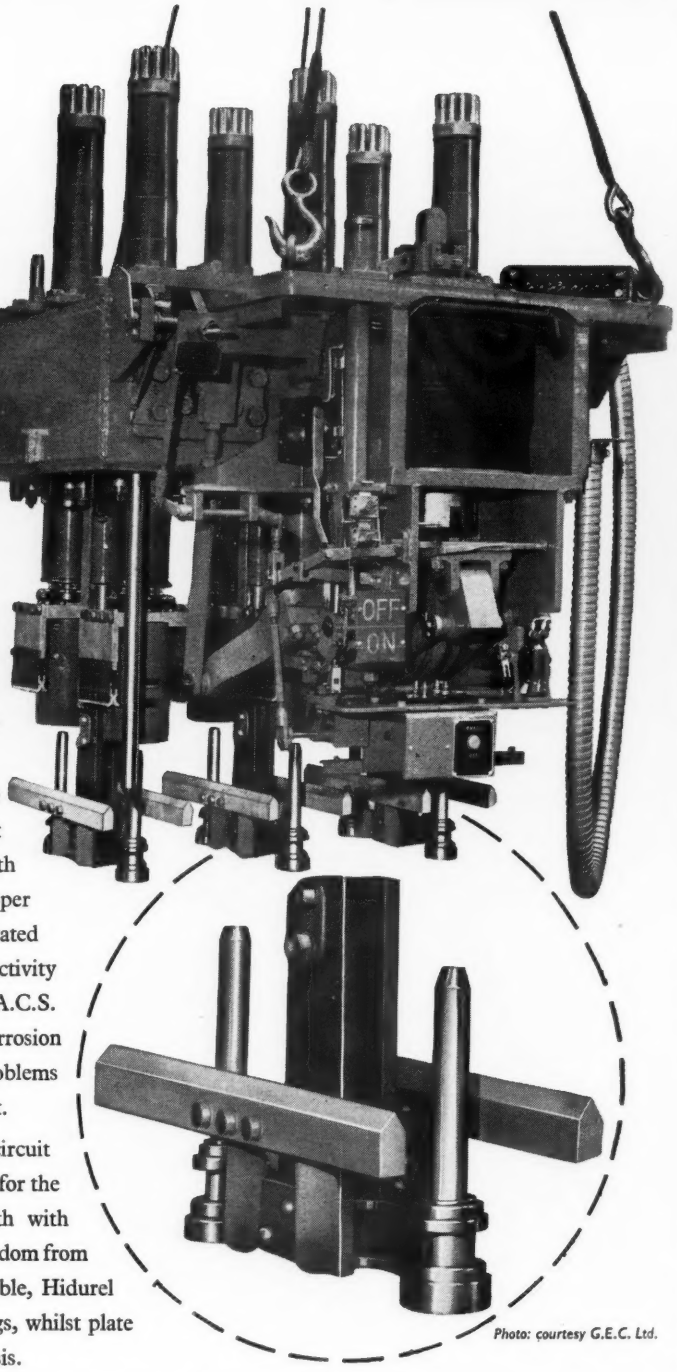

Photo: courtesy G.E.C. Ltd.

Electrical components required to perform severe mechanical duties in addition to the current carrying function demand materials combining both strength and conductivity. Hidurel, a tough, copper based alloy, offers high strength, even at elevated temperatures, together with good electrical conductivity (approximately 40% I.A.C.S. Hidurel 5, 85% I.A.C.S. Hidurel 6). Resistant to industrial atmospheric corrosion and non-magnetic, Hidurel solves many problems associated with the design of electrical equipment.

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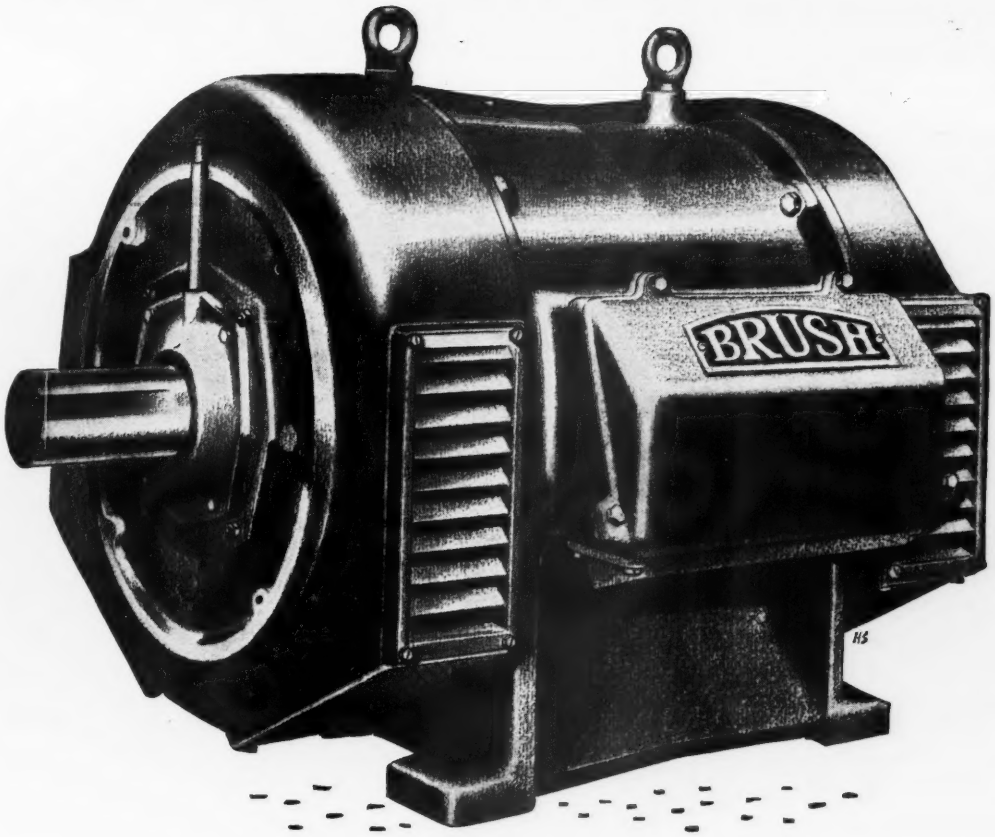

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On the face of it, it's just another electric motor, I know, sir.
But you see, being a BRUSH motor makes quite a difference.

Why? I'm afraid I can't see any difference.

Well, I suppose it's a matter of experience. These Brush people were among the first manufacturers of electric motors and such. And this experience shows—in the workmanship of even the smallest parts, and all the thousand-and-one details of the construction.

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All right! Say no more. I'm convinced. For once, we've done the right thing. It seems that everybody's going to be pleased the new machine is powered by Brush.

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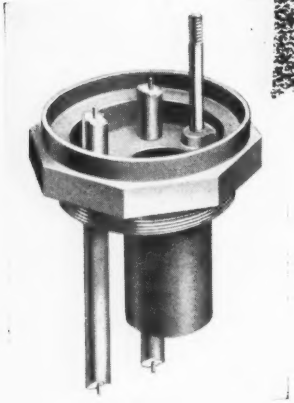

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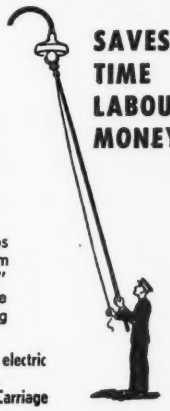

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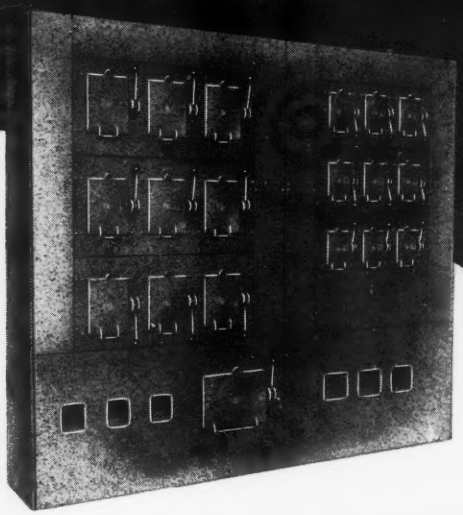

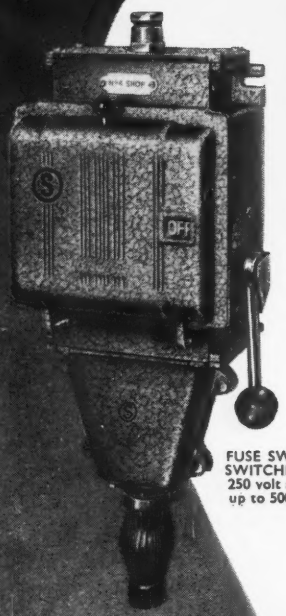

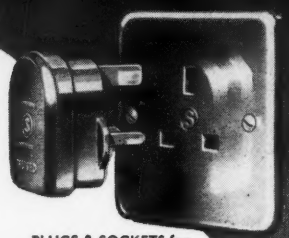

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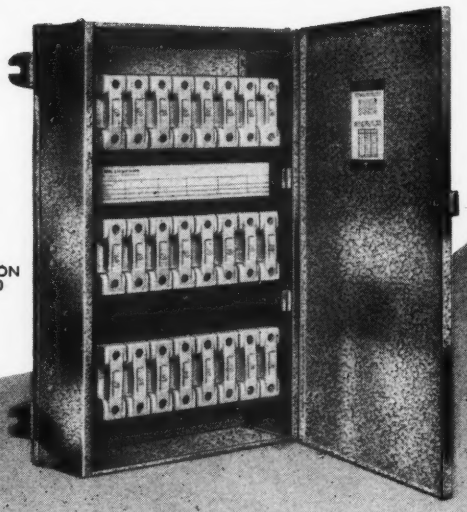

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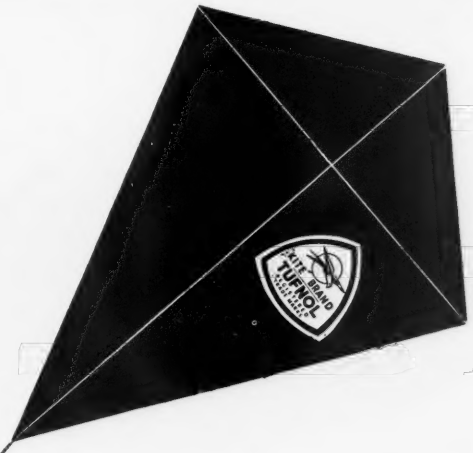

Black Kite at Redruth

*Climax of Redruth, Cornwall, chose black Tufnol panels made from Kite Brand for their heavy duty switchboards.

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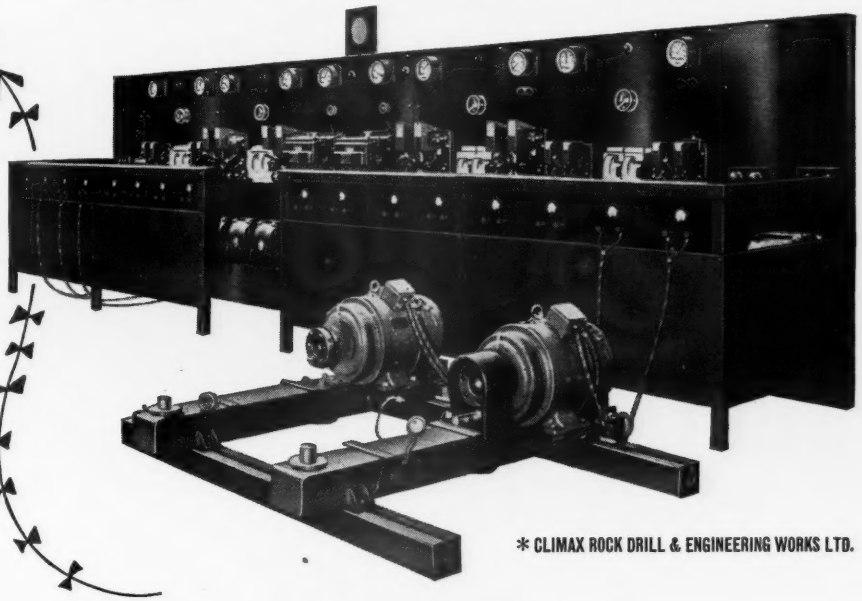

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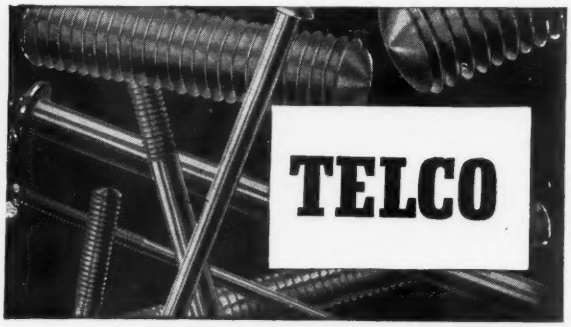

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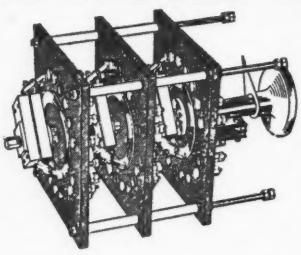

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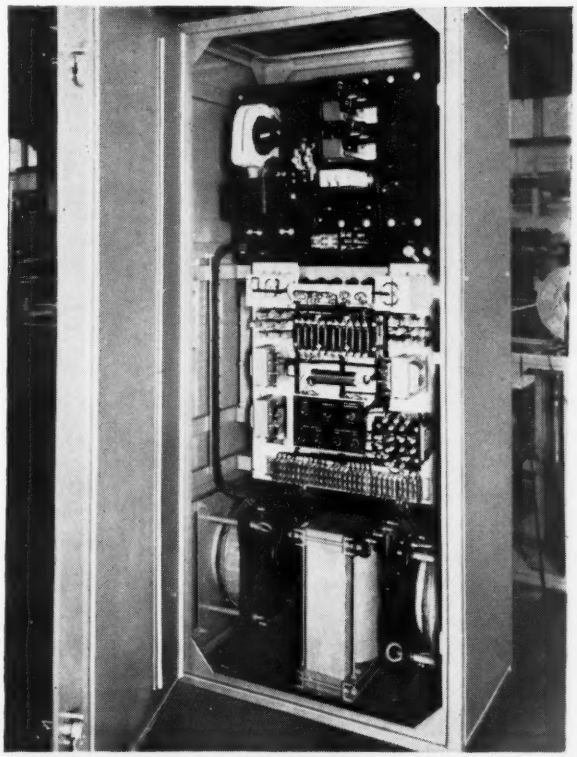

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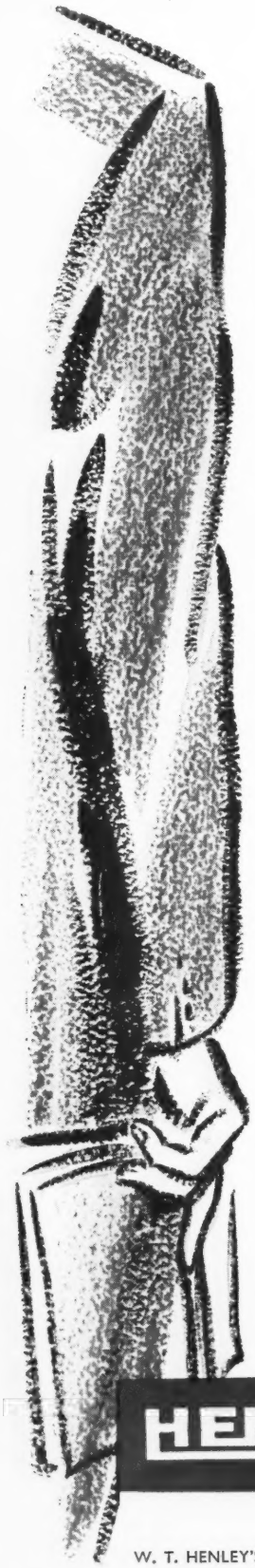

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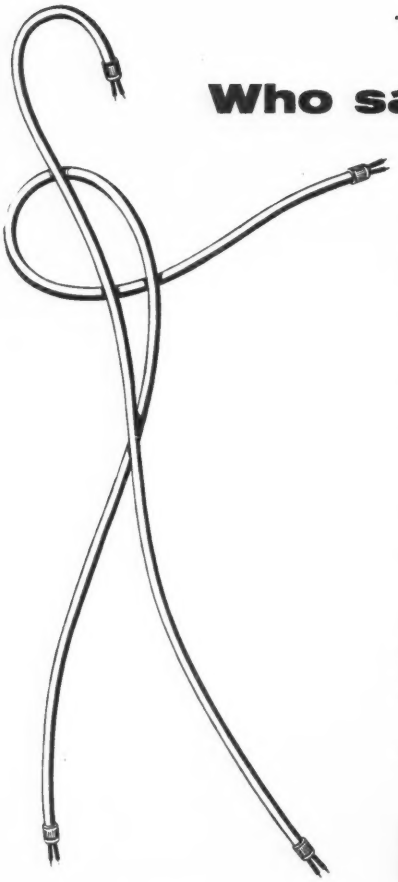

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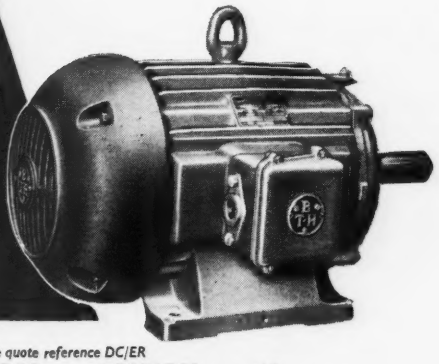

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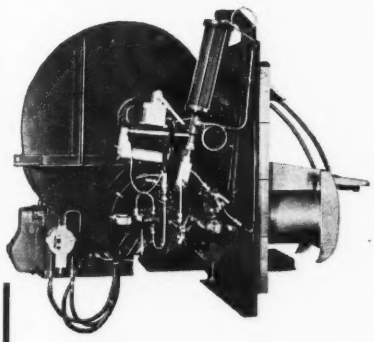

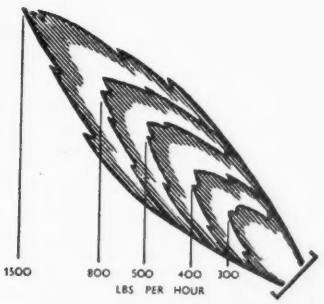

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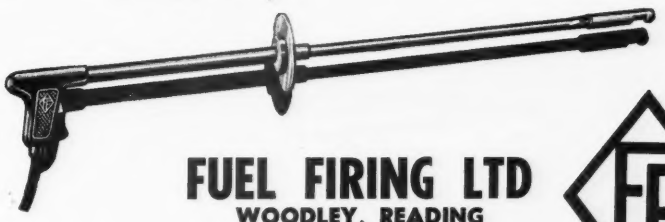

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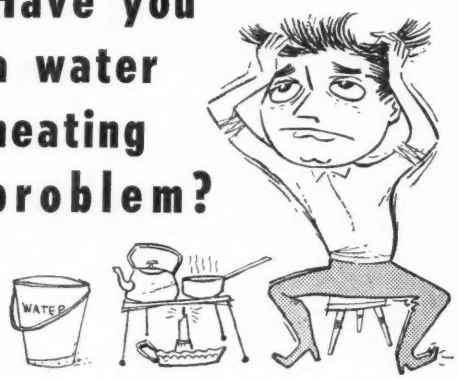

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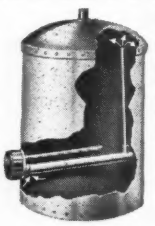

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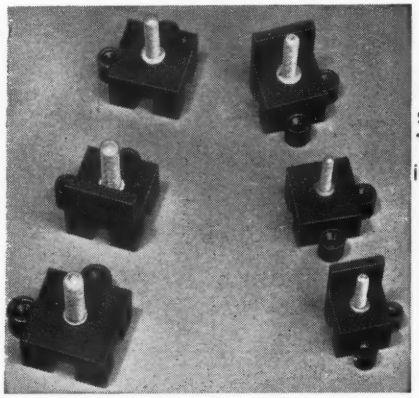

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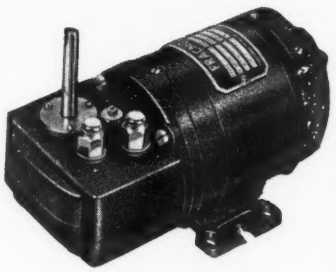

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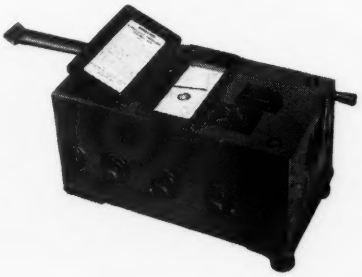

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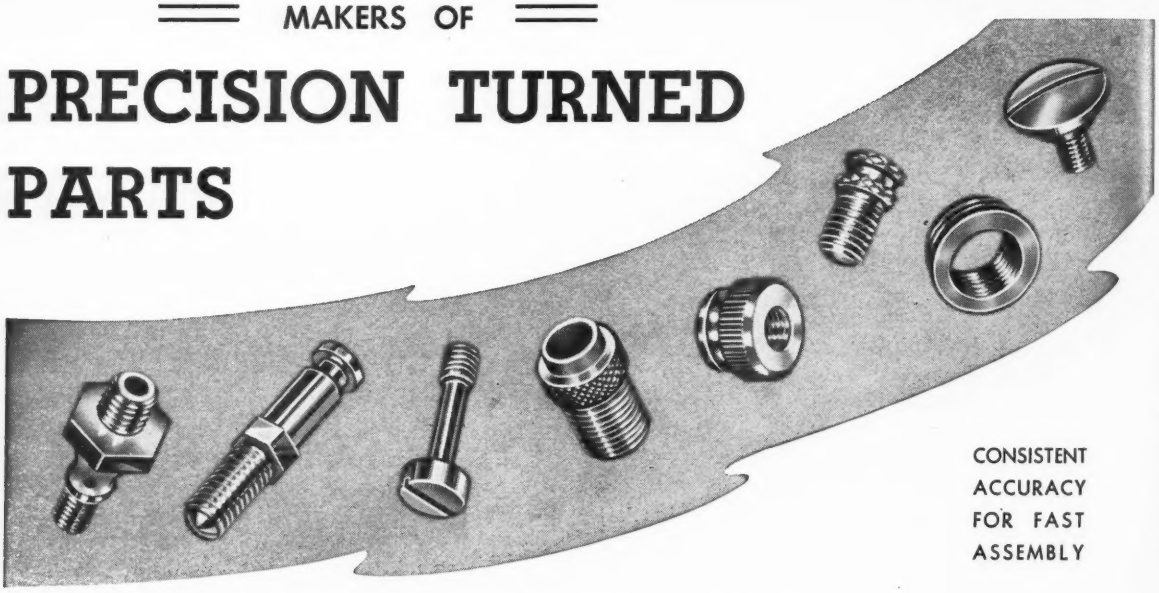

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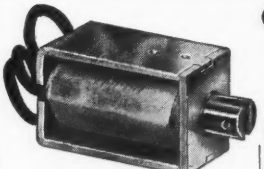

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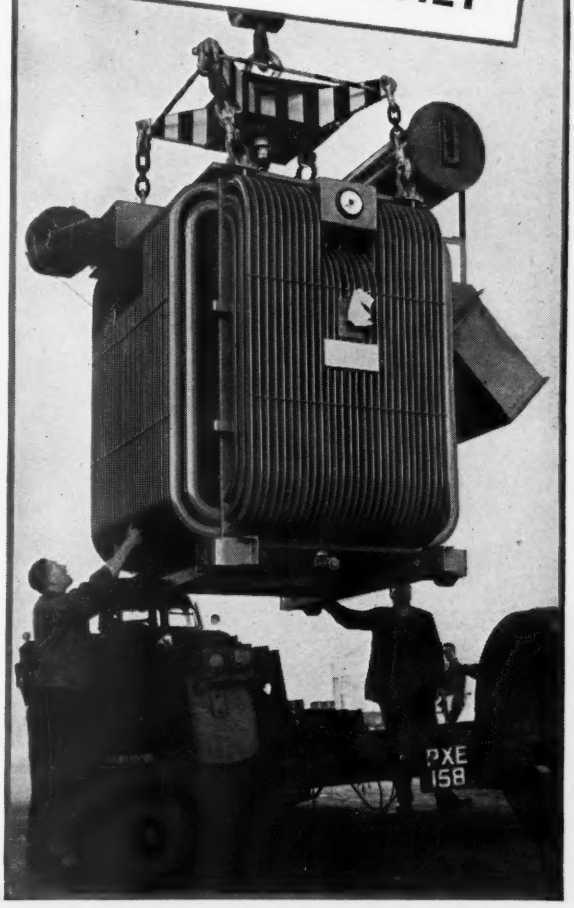

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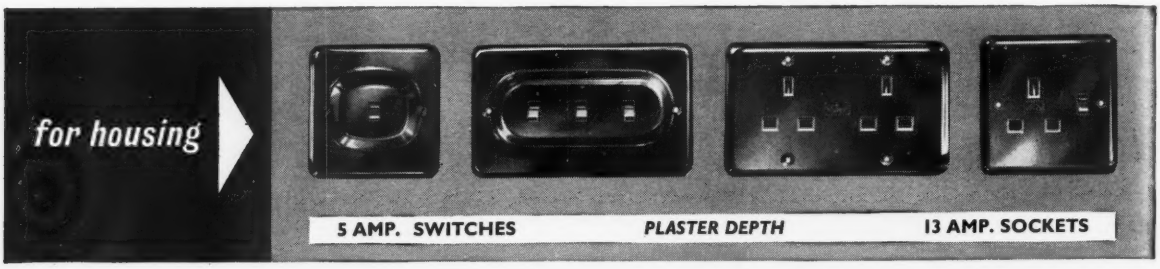

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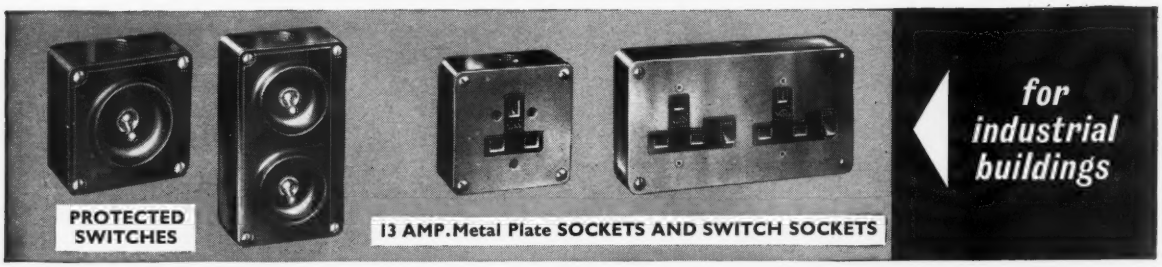

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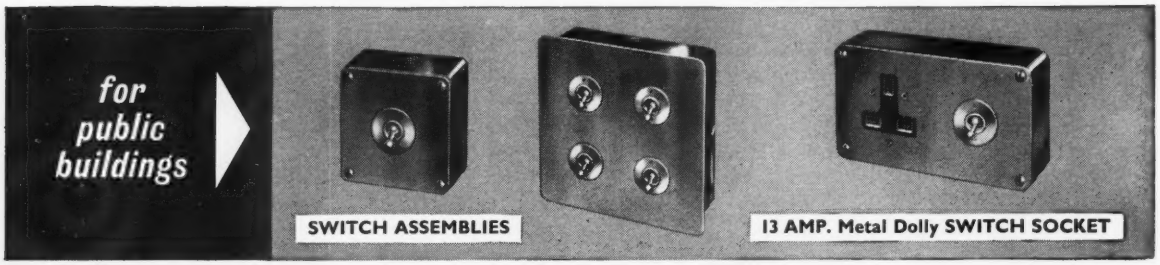

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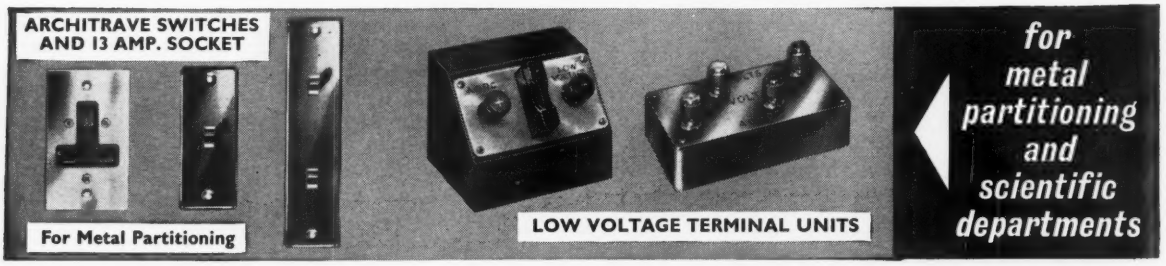
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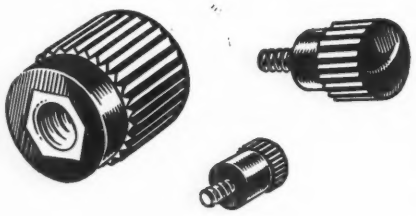

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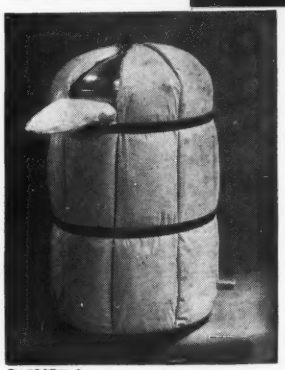

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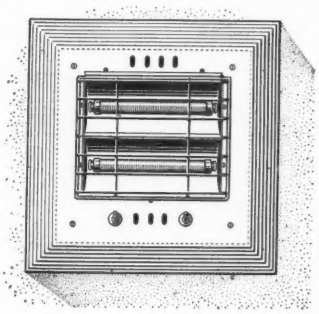

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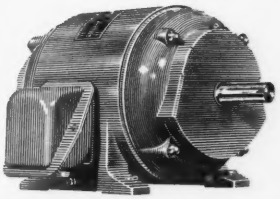

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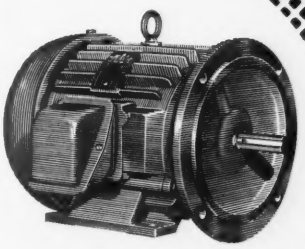

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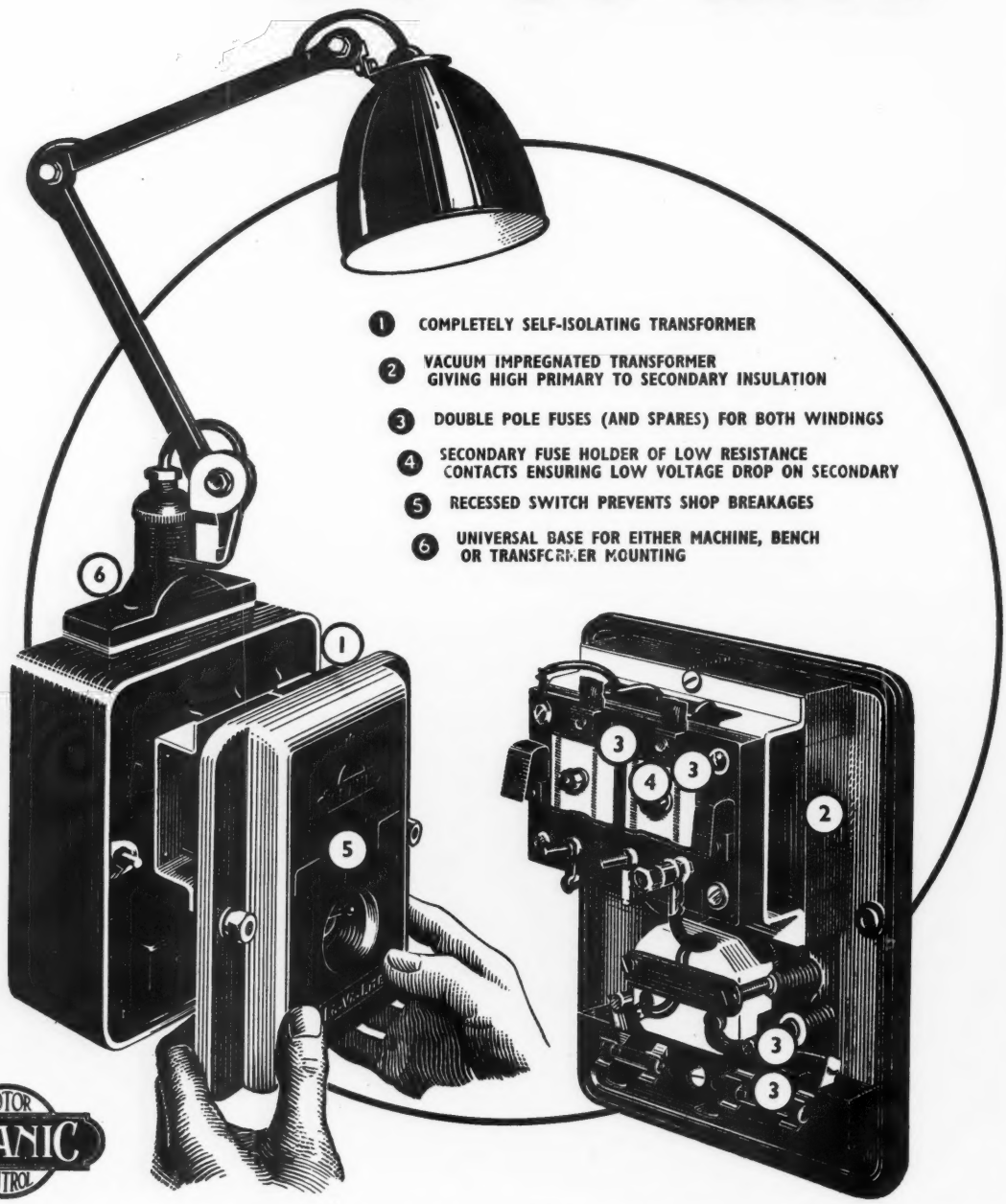
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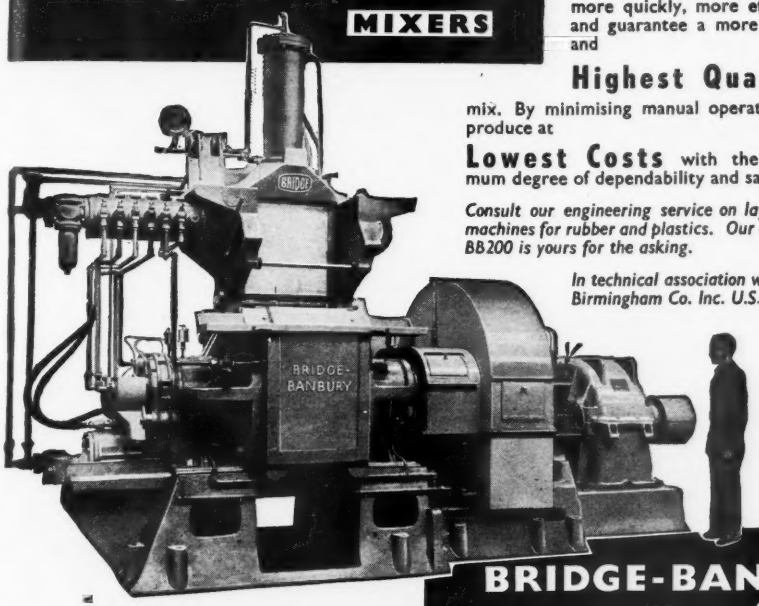

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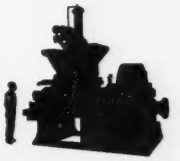
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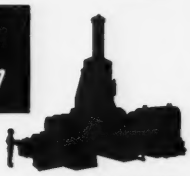
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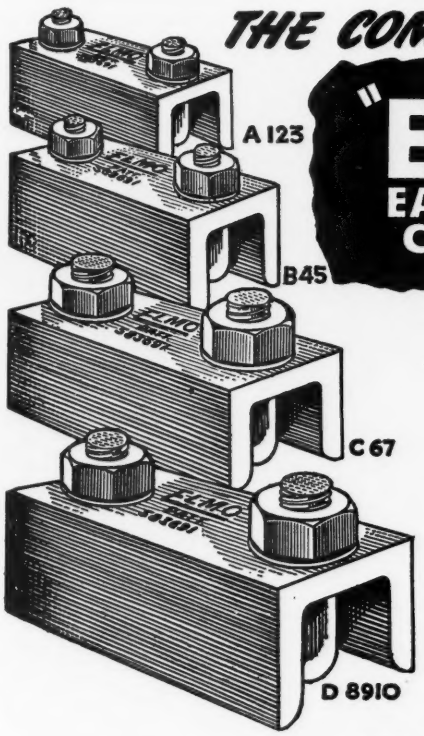

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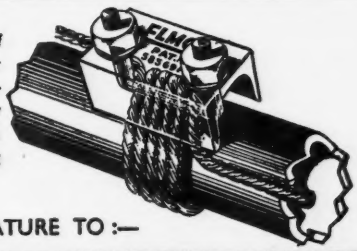

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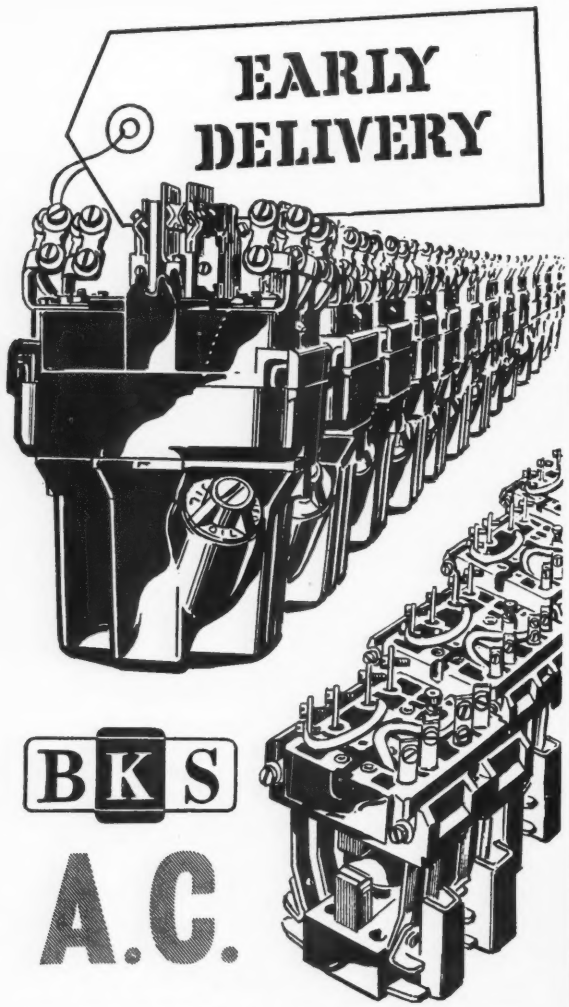

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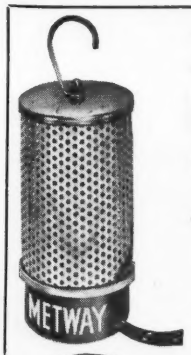

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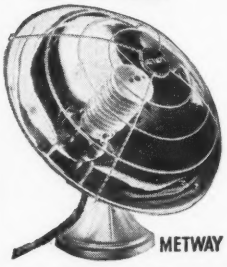

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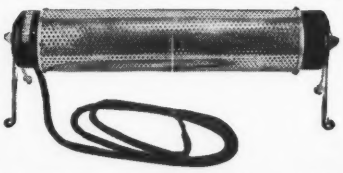

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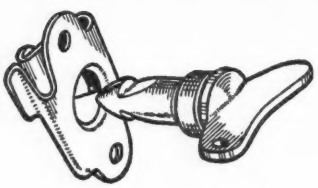

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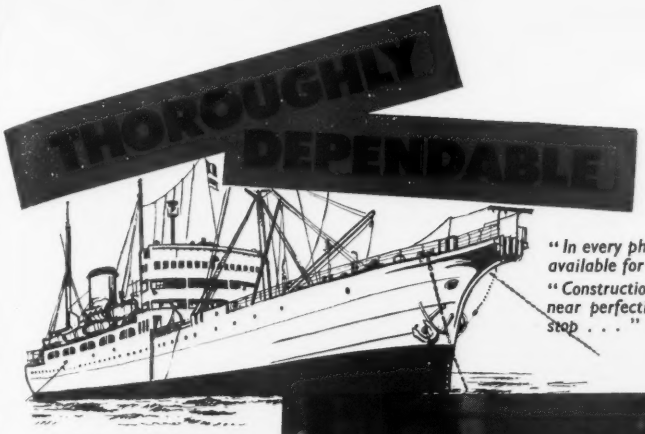

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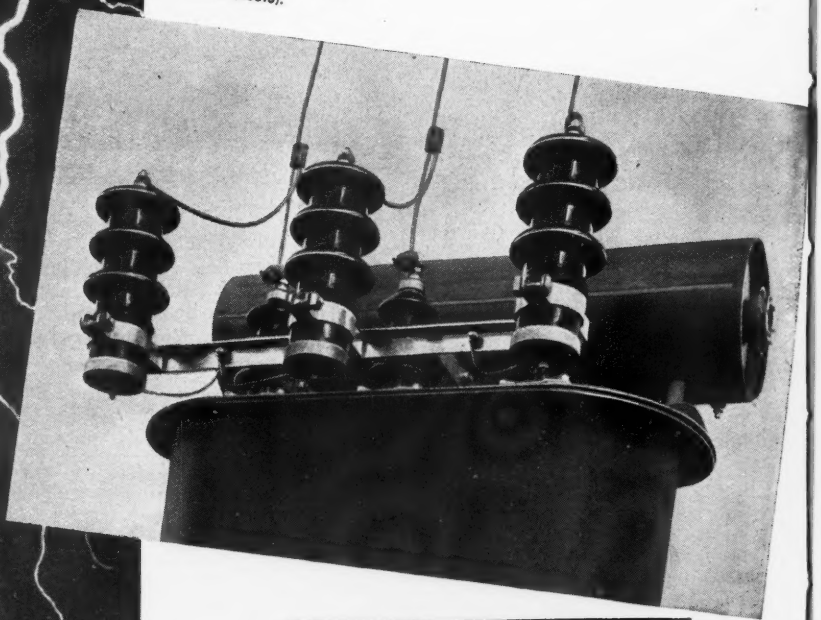

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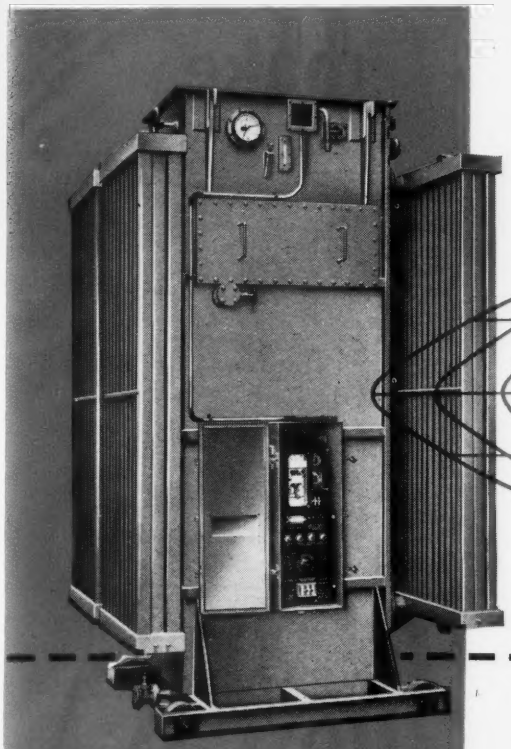

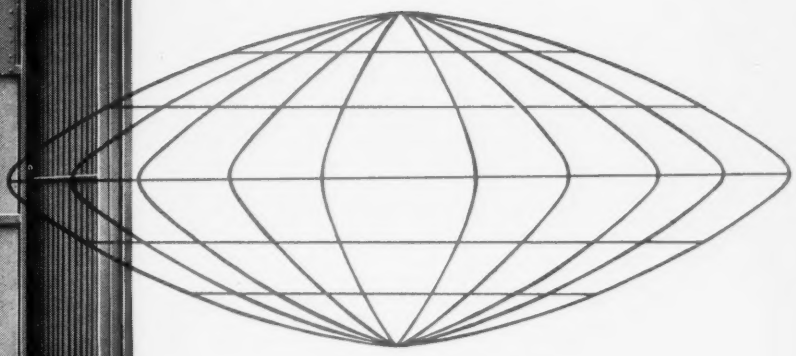

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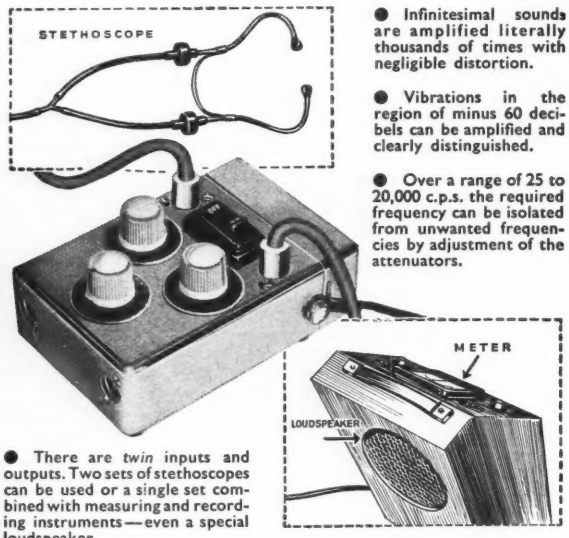

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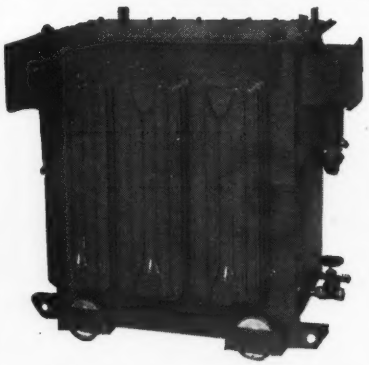

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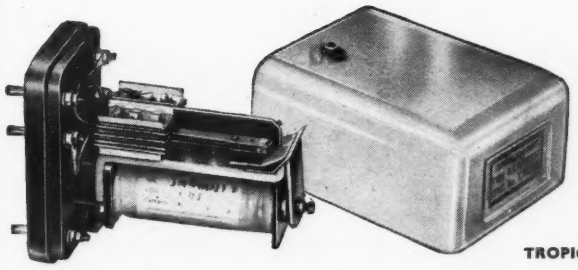

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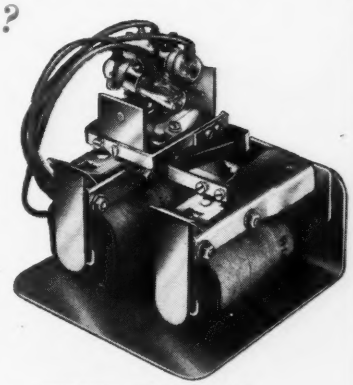

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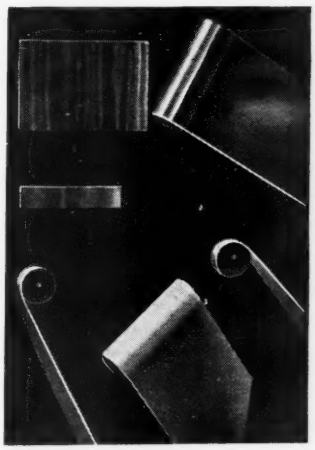

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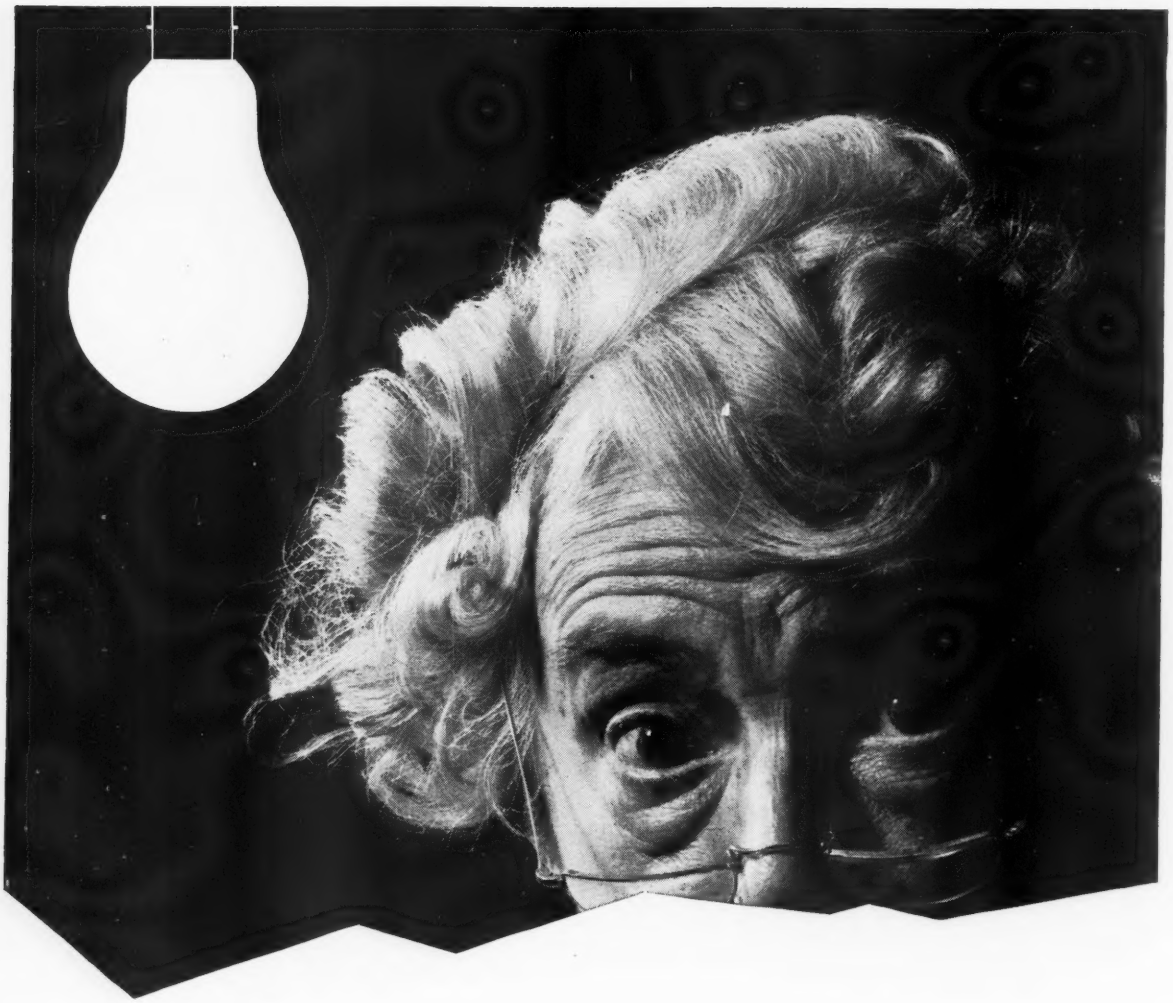

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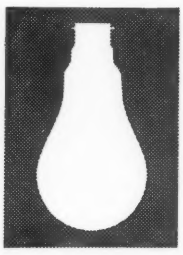

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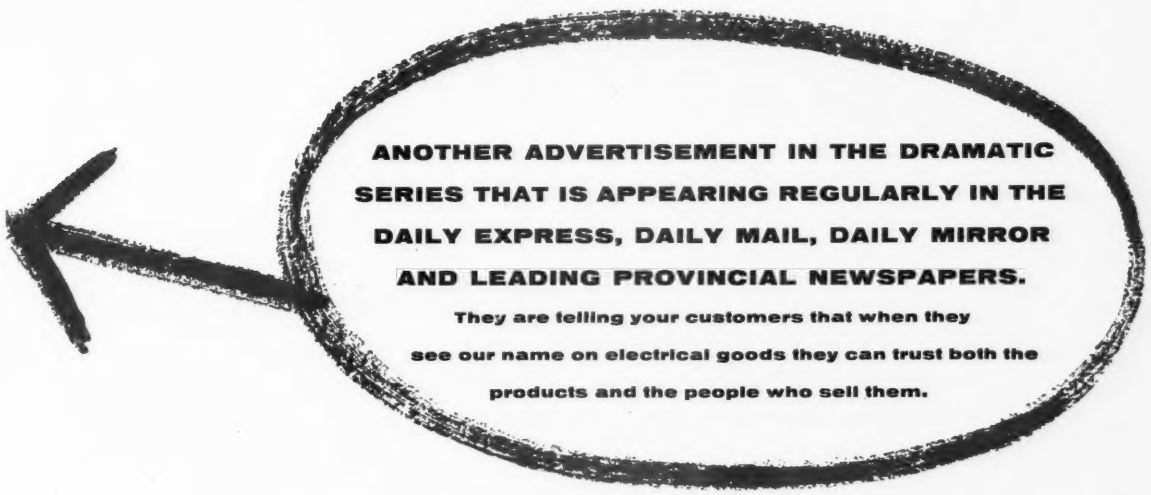
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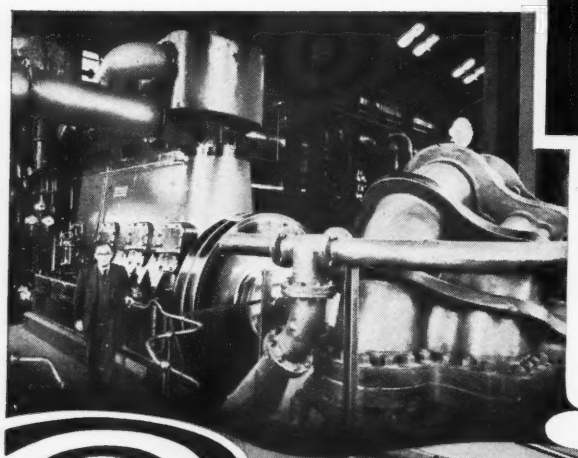

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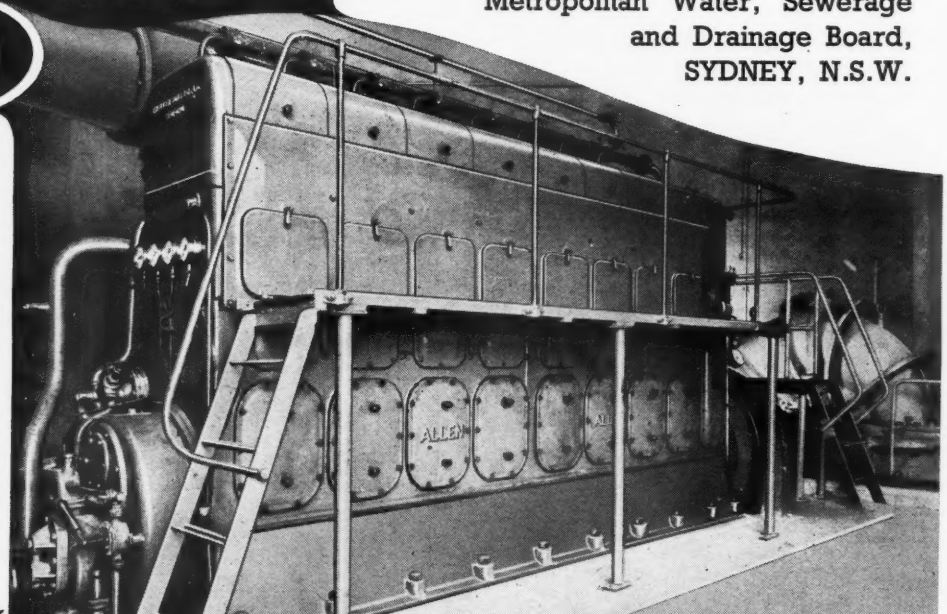

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Illustrated above is an Allen 1,100-b.h.p. triple expansion steam engine driving a 24-in. pump at 275 r.p.m., in the Potts Hill Pumping Station, Sydney. The engine commenced its working life in 1904, driving a generator in the old Melbourne Tramways Board power station. Since its transfer to Sydney in 1923 for pumping service, the unit has run, non-stop, ten months every year, supplying 620,000 gallons of water per hour at 130 feet head, and is still in regular service.

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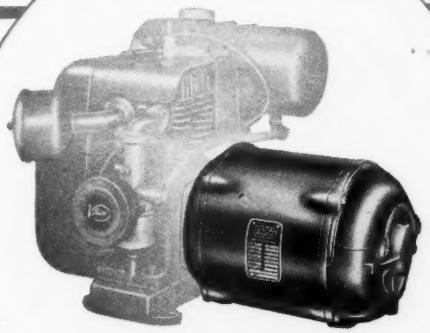

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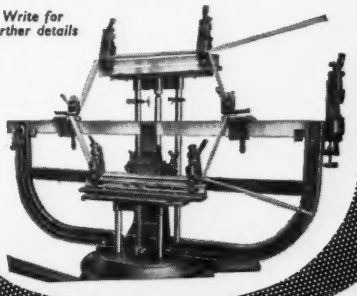

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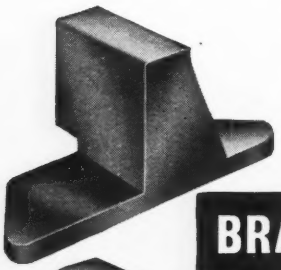

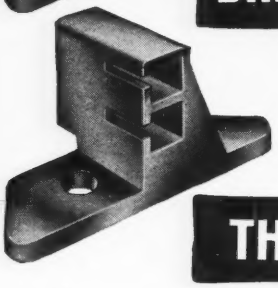

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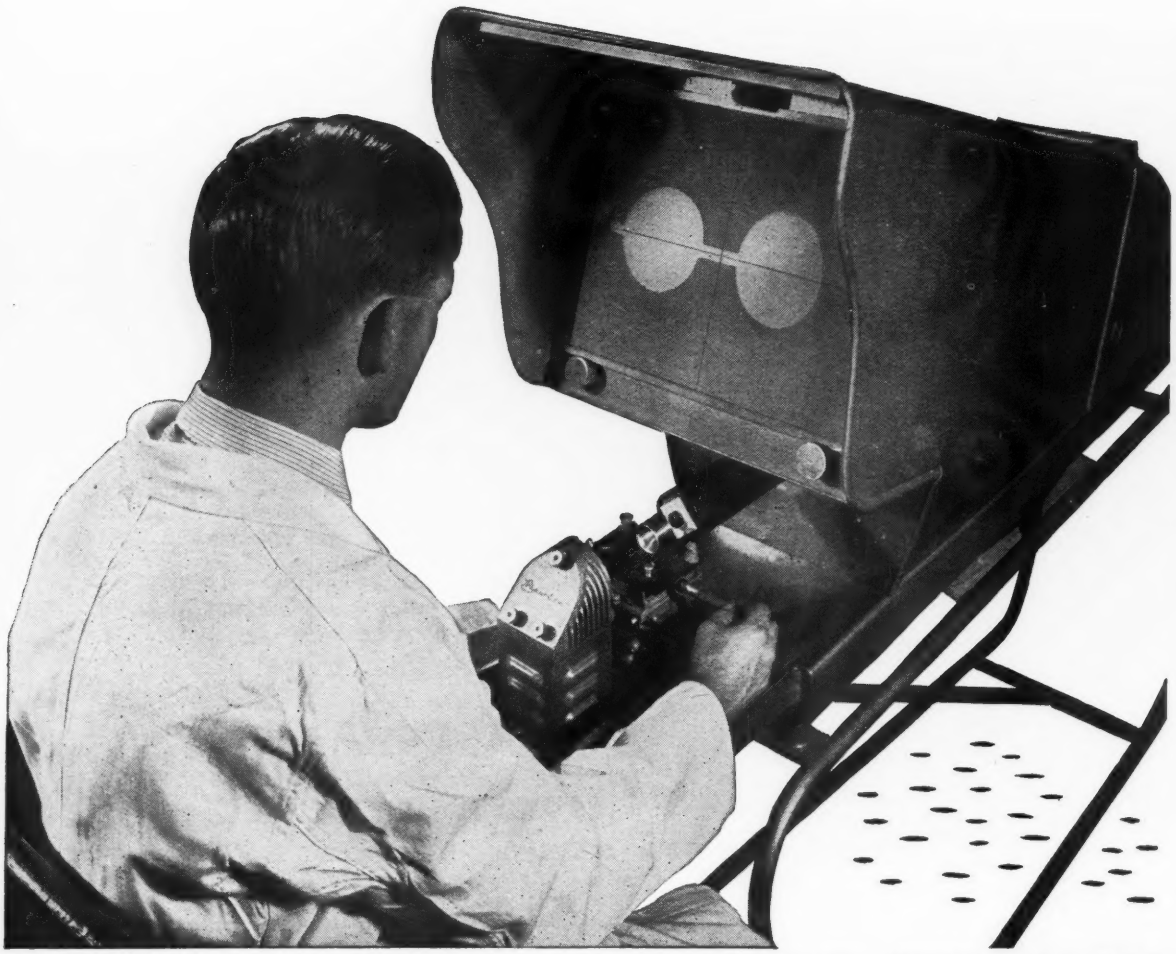

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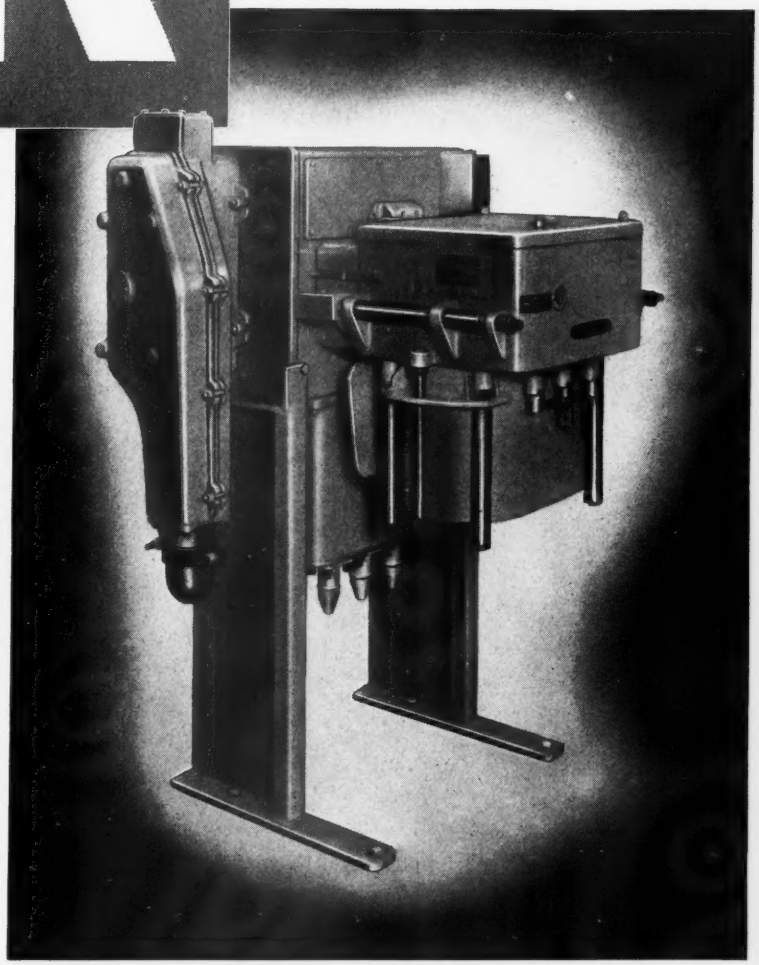

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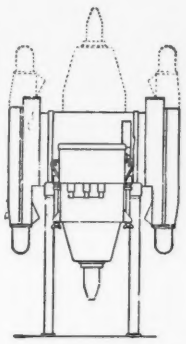

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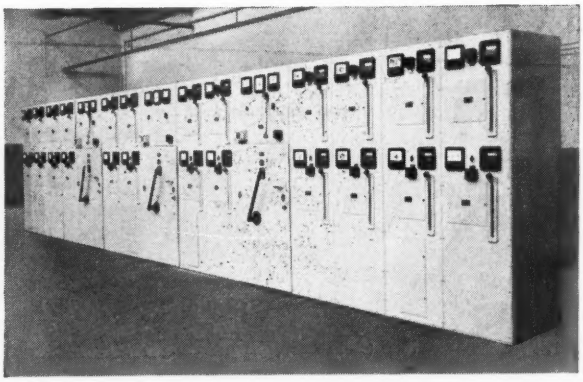

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30 AUGUST
1957

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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VOLUME 161 NUMBER 9 ✧ *Eighty-Fifth Year of Publication* ✧ FRIDAY PRICE 1s 6d

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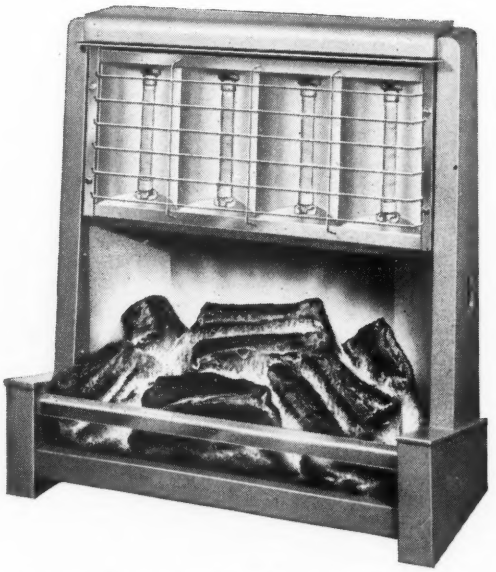

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ELECTRICAL REVIEW

30 August 1957 Vol. 161 No. 9 Established 1872

Professional Engineers' Status

BECAUSE it is so widely applied to mechanics the description " engineer " does not rank so high in public esteem as it should. Many half-hearted attempts which have been made to rectify this have come up against what seem to be insuperable difficulties. Registration is really the only remedy, but in this country Governments display little interest in the possibility although engineers in some other countries are required to be registered before they can use the term.

The Engineers' Guild has now embarked on a policy which aims at securing the acceptance of a definition of the engineering profession by the Government, industry and the public. It does not go so far as to advocate registration, but that may possibly be implicit in any endeavour to secure " acceptance " by the Government.

Recognition of the standing of professional engineers would, of course, be a guarantee to clients that their work if placed with anybody so called would be properly planned and carried out. On the other side of the shield it would help to ensure that professional engineers were properly rewarded for their services.

Another aspect stressed by the Guild is the poor representation of the engineering profession in the highest managerial and administrative posts. This, it is admitted, may be as much a reflection upon the professional engineers themselves as upon those responsible for making appointments. Therefore the engineer is to be encouraged to equip himself to accept management and administrative functions while steps are also to be taken to ensure that no restrictions are placed on opportunities for engineers in this direction.

The Guild realises that the promulgation of the policy means the employment of " public relations " methods. In addition to what is being done already, the Guild is taking steps " to increase public awareness of the work and responsibilities of the professional engineer and of his fundamental importance in the economy of the country." Any effective campaign of this kind will obviously be costly and so the Guild proposes to increase subscriptions and endeavour to recruit more members.

This raises the question whether the Guild is at present strong enough or representative enough to succeed in its laudable objects. Members and associates number about 4,700 but the combined corporate membership of the three leading engineering institutions is about 63,000. A somewhat parallel situation exists in the United States where the National Society of Professional Engineers is the rough equivalent of the

Engineers' Guild. This organisation's membership is not known but the *Electrical World* states that only a small minority of the 50,000 members of the American Institute of Electrical Engineers is affiliated to it—and the A.I.E.E. is only one of the professional bodies concerned.

It would seem, therefore, that the Guild first of all needs to publicise itself and recruit many more members. Not until that has been done will it be influential enough to secure the ends for which it is campaigning.

A GREAT EXHIBITION

The Engineering, Marine, Welding and Nuclear Energy Exhibition, which was opened yesterday by Sir Christopher Hinton at Olympia, London (and is reviewed in this issue), provides an accurate, if only partial, reflection of the activities of a great group of industries. With the increasing size of the plant now required, models, photographs and drawings have to take the place of the equipment itself, particularly in the nuclear energy section. Nevertheless, there is plenty of actual equipment to be seen on the stands of the 500 exhibitors and the range extends from prime movers, among which diesel engines are particularly well represented, to a glass that offers protection against radiation.

In the electrical field welding apparatus of different designs occupies the most prominent place, an indication of the increasing extent to which this form of connection is now being used. On the other hand, motors and switchgear, although present as accessories to exhibits of tools of all kinds, are less individually represented than has sometimes been the case. Altogether the display that has been organised is worthy of British engineering.

VOLTA RIVER

Political events in Ghana have obscured the position of the Volta River hydro-electric scheme which has now been under consideration since a Government White Paper on the subject was published in 1952. It was then said that the power station envisaged would have an ultimate capacity of about 600 MW, most of which would be required for aluminium production. The £54 million for the power scheme was to come from the United Kingdom and Gold Coast Governments while the bulk of the cost of the aluminium smelter (£64 million) would be met by the aluminium interests. Later a preparatory commission was set up and last year it presented a report giving much detail of the actual scheme and dealing with the economic and financial aspects. It was noted that the two Governments and the aluminium interests had reaffirmed their interest in the project.

Since then the Gold Coast has become Ghana and is now self-governing. Early this year there were indications that the Ghana Government was looking to the United States for financial aid for the scheme for an American mission was visiting the country to make a preliminary survey. It was announced that a group of American companies had been given until 18th July to enter into negotiations with the Government but *Reuter* reported last week that the option had expired and that a Government spokesman said that they were " now free to negotiate with the original partners in the project or with any other interests." There the matter unsatisfactorily remains at the moment.

ELECTRICAL CONTRACTORS AND BUILDING WORK

A great deal of electrical installation work and the supply of electrical equipment is done as part of building work. In such cases the main contract is between the architect, consultant or client and the building contractor, electrical work being the subject of sub-contracts.

Practice in the matter of prices and discounts in the building industry is regulated by a form of contract agreed between the Royal Institute of British Architects, the building trades employers and the Royal Institution of Chartered Surveyors. In some respects this varies from the requirements of the Electrical Fair Trading Policy and in any event requires elucidation from the electrical point of view. To meet this need the Electrical Fair Trading Council has amended the relevant clauses in its schedules and has issued a booklet giving guidance on the subject. On page 375 of this issue Mr. A. R. Lowe, secretary of the Council, explains the circumstances which have made this necessary.

HUMIDITY AND STORAGE

General agreement was expressed at the international symposium on electricity in the tropics, which was held in Paris last year, with the view that atmospheric humidity was the most harmful factor in reducing durability of materials. In such regions relative values often vary between 65 and over 80 per cent within twenty-four hours. This is of especial significance in connection with the export of goods which may have to be stored for a while at either end.

In the latest annual report of the Department of Scientific and Industrial Research (reviewed in our 16th August issue) the essential requirement for uncoated steel articles in storage was stated to be that the relative humidity of the air in contact with the metal surfaces must never exceed 70 per cent and should preferably be below 50 per cent. This applies whatever may be the fluctuations in atmospheric temperature and humidity, thus usually necessitating air conditioning throughout the year.

ELECTRIC COOKERS

Particulars of type, size, oven loading and control, hotplates, special features and price of most makes of electric cookers will be given in the next of our surveys of domestic electrical equipment (*Electrical Review*, 6th September). Many models will be illustrated. The following survey (27th September issue) will deal with food mixers

Engineering Exhibition at Olympia

REVIEW OF ELECTRICAL, WELDING AND ALLIED EQUIPMENT

THE Engineering, Marine, Welding and Nuclear Energy Exhibition, which opened at Olympia, London, yesterday and will remain open until 12th September, is the latest in a series, which was inaugurated in 1906 and has since been held with varying titles in alternate years with intervals for two world wars. On this occasion nuclear energy has been included in its scope mainly in the form of models and pictorial displays. Owing to the increasing size of the plant now being manufactured models also find an increasing place in other fields. In all, three halls and galleries are occupied, there being some 500 exhibitors who are utilising more than 250,000 sq ft of space. The part played by electricity in general engineering is evident both directly and indirectly, but special mention may be made of the many examples of welding equipment shown. In order to convey some idea of what is to be seen we have roughly segregated those exhibits which will be of interest to our readers under various headings.

BOILERS, TURBINES AND MACHINES

Prominent among the nuclear energy exhibits is a detailed sectional model of one of the heat exchangers which is being made by Babcock & Wilcox, Ltd., for the Calder Hall and Chapelcross atomic power stations. These are 80ft high by 17ft in diameter. There is also a model of a typical welded pressure vessel for a reactor of the pressurised water type with which are combined samples of a " push-out " formed in 6in steel plate and of a weld between very thick plates to illustrate the techniques required in the construction of reactor pressure vessels.

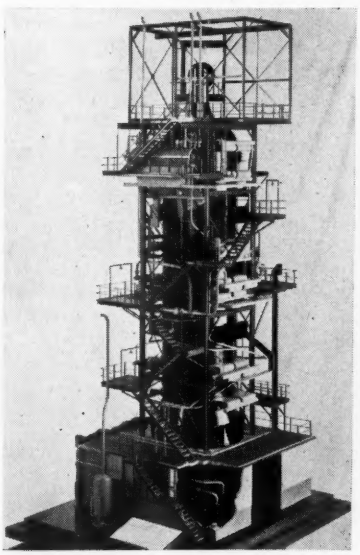
An adjacent display shows graphically how increases in the designed output and efficiency of a nuclear power station depend directly on ability to weld satisfactorily mild steel or alloy plate. A further interesting model is one that has been made in the company's research department to assist in the construction for the Atomic Energy Authority of an equipment known as the " Dido loop." The purpose of this is to test the effect of " in-pile " radiation on the aqueous corrosives of water-cooled fuel elements.

Owing to the moves which are now being made to reduce atmospheric pollution in industrial areas attention may be called to the smoke alarm exhibited by Ronald Trist & Co., Ltd. This consists of an optical unit which is made in two types, both of which comply with B.S. 2740 and give warning that the smoke being emitted from a chimney has exceeded a predetermined limit.

Nuclear energy is also prominent on the stand of C. A. Parsons & Co., Ltd., the central exhibit being a completely bladed low pressure turbine shaft for a 23 MW turbo-generator, sixteen of which the firm are installing at the Calder Hall " A " and " B " and Chapelcross power stations.

As illustrating the firm's activities in a more conventional field there are artists' impressions of the 200 MW single-line machines which are under construction for the Central Electricity Authority and of the cross-compound units of the same output which are being manufactured for installation in the Richard L. Hearn generating station of the Hydro-Electric Power Commission of Ontario in Toronto. The single line sets will operate at 3,000 r.p.m., the steam conditions being 2,350 lb/sq in and 1,050 deg F with re-heating at 1,000 deg F. There is a single generator. The steam conditions of the cross-compound machine will be 1,800 lb/sq in and 1,000 deg F at the stop valve. The h.p. and i.p. sections will run at 3,600 r.p.m. and drive a single 100 MW generator at 3,600 r.p.m. The low pressure section will drive a second 100 MW generator at 1,800 r.p.m.

G. & J. Weir, Ltd., are showing a horizontal geared turbine of the type which is used in tankers to drive cargo oil pumps. It is also typical of the units supplied by the company for operating sugar mills and forced draught fans. It is of the impulse type with one pressure and two velocity



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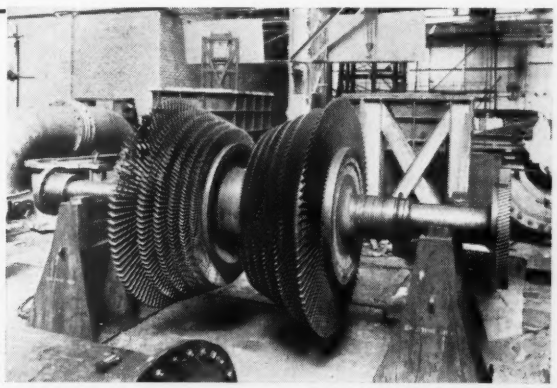

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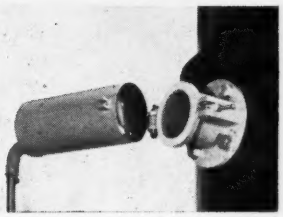

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1. Model of 80ft by 17ft Babcock & Wilcox heat exchanger. 2. Parsons bladed i.p. turbine shaft for Calder Hall. 3. Trist smoke density indicator

stages and is equipped with hydraulic speed and oil pressure governors as well as with tachometers. It has an output of 730 h.p. at 6,500 r.p.m., the speed of the output shaft being 1,500 r.p.m. It is supplied with steam at 570 lb/sq in and 608 deg F. A feature is that the exhaust steam is entirely free from oil and can be used in the feed system or for process work.

Crompton Parkinson, Ltd., are exhibiting an example of a self-regulating alternator which has recently been placed in production. This is being manufactured with outputs from 6 to 135 kVA and is fitted with a " Magnicon " exciter. The armature is quill-mounted on an extension of the main shaft from which it is driven.

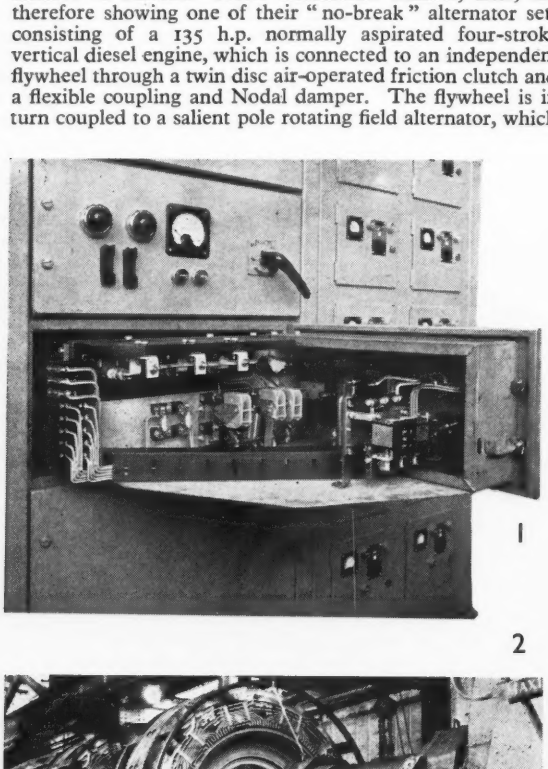
Nuclear power generation, telecommunications, radar and electronic circuits of various kinds all require a constant supply of electricity to avoid the losses caused by temporary failures of current. Lister Blackstone Marine, Ltd., are therefore showing one of their " no-break " alternator sets consisting of a 135 h.p. normally aspirated four-stroke vertical diesel engine, which is connected to an independent flywheel through a twin disc air-operated friction clutch and a flexible coupling and Nodal damper. The flywheel is in turn coupled to a salient pole rotating field alternator, which was manufactured by the Electric Construction Co., Ltd., and has a three-phase output of 85 kW at 380 V and 50 c/s. The control equipment consists of pneumatic valves which operate the fuel pump and the clutch as well as a quick acting circuit-breaker. Normally power is obtained from the mains, but should this fail the clutch is automatically brought into action and the engine is started by the flywheel. When the public supply is restored the main circuit-breaker is again closed, the clutch disengaged and the engine comes to rest.

The range of exhibits on the stand of W. H. Allen, Sons & Co., Ltd., represents some of the specialised activities of the company and includes power plant, pumps and electrical equipment for use both on board ship and on land. The largest exhibit is a 410 kW marine auxiliary pressure-charged diesel engine set. This comprises a five-cylinder 600 b.h.p. engine running at 450 r.p.m. which is coupled to a direct-current generator. It is typical of the firm's range of marine diesel generating units of both the four-stroke and two-stroke types which are built with from three to eight cylinders in outputs from 75 to 640 kW. The four-stroke engines are also available in outputs from 115 to 1,068 h.p. and the two-stroke from 324 to 1,080 h.p. for industrial purposes. The engines are of the vertical solid-injection design and employ direct combustion. They are arranged for cold starting on compressed air.

The pumping plant includes a vertical double-suction centrifugal unit with an output of 990,000 gal of water per hour against a total head of 29ft when running at 485 r.p.m. It is typical of many similar pumps which have been installed to deal with circulating water in power stations.

The part played by the British Thomson-Houston Co., Ltd., in turbo-electric and diesel-electric ship propulsion is portrayed at the exhibition by a number of diagrams and pictures. These include illustrations of the 90,000 s.h.p. turbo-electric equipment for the new 45,000 ton passenger liner which is being built by Harland & Wolff, Ltd., at Belfast, for the P. & O. Company. This is the largest passenger vessel to be constructed in Great Britain since the *Queen Elizabeth*. Some of the main parts of the 1,200 h.p. gas turbine, which have been removed from the tanker *Auris* after 20,000 hours' running, are being shown to demonstrate the high quality of the material used, while another exhibit is a model of the 5,500 h.p. gas turbine and gear drive which is to be installed in the same ship to replace the original equipment.

The company's activities in the nuclear energy field are being illustrated by an artist's drawing of the station under construction at Berkeley on the Severn estuary. Heavy plant is represented by a model of one of the two



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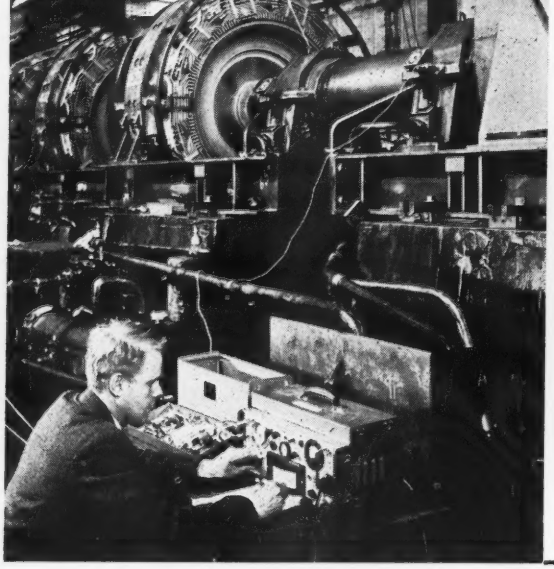

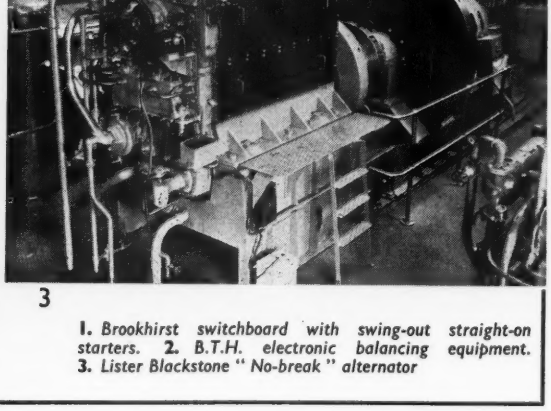

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1. Brookhirst switchboard with swing-out straight-on starters. 2. B.T.H. electronic balancing equipment. 3. Lister Blackstone " No-break " alternator

66,667 kVA, 150 r.p.m. water wheel alternators which are now in use at the Eildon power station in Australia. The electronic equipment includes "Rotabalance" apparatus for the final balancing of rotating machines and a photo-electric relay/"Emotrol" unit which is shown in operation.

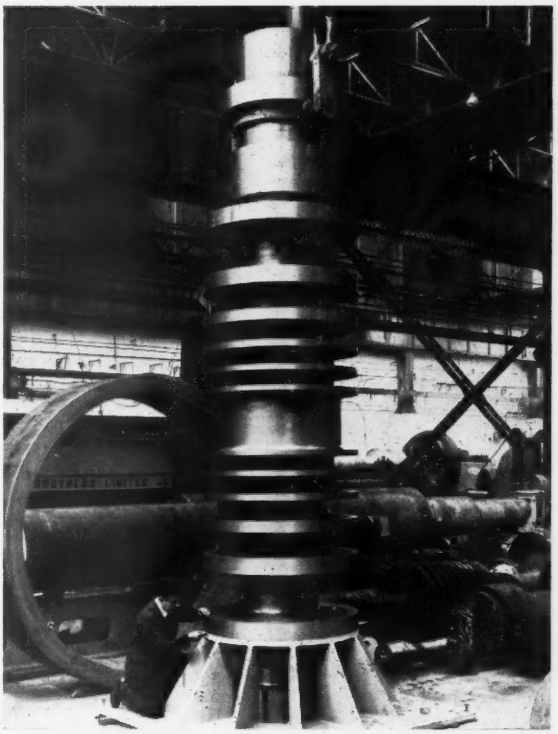
The new explosion-proof motor shown by Newman Industries, Ltd., is claimed to be the first of British manufacture to have obtained the approval of the American Underwriters' Laboratories for machines of this kind with outputs from ½ to 30 h.p. This is something of a feat since the specification of that body for explosion-proof motors is very rigid and the field has hitherto been virtually a "closed shop" to other than American and Canadian manufacturers. In fact firms in this country producing petroleum, chemical, mining and similar equipment have had to have the necessary motors fitted in the States. In addition, emphasis is directed to a new range of drip-proof motors with outputs from ½ to 50 h.p., which have been built to the new draft British Standard Specification. These have Class E insulation which permits a temperature rise of 65 deg C.

A new version of a recently introduced switchboard is being exhibited by Brookhirst Switchgear, Ltd. This is known as the "Chester Minor" and is designed for both industrial and marine use. It is built up from flush-fronted cubicles of sheet steel. Each unit accommodates a busbar chamber at the top or bottom and vertical riser bars. There are also tiers of starters of various ratings as well as distribution gear, when required. The equipment is of the isolating swing-out or draw-out type according to the size of the contactor or switch. The use of trailing cables is avoided by plug-in contacts which enable the starter to be instantly removed.

An outstanding feature on the stand of Thos. Firth & John Brown, Ltd., is a 31½ ton forged steel rotor shaft standing 18ft 8in high. This is placed on a steel plate 8ft square and 2in thick with welded sections to secure it firmly when it is in a vertical position. The forging as shown is rough machined "gashed," but will subsequently be fully machined and fitted with stainless steel blading at the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd. The finished product will form part of a double-flow low-pressure 120 MW turbine which is to be erected at Staythorpe.

The lightweight motors shown by the Electro Dynamic Construction Co., Ltd., are intended for use on battery vehicles and are made in either the enclosed ventilated or totally enclosed types. The field system is of the split pole design, and all the machines are insulated with Class B heat-proof materials and are vacuum impregnated. Leads can be brought out in groups for series-parallel control.

Two stands are occupied by the Metropolitan-Vickers



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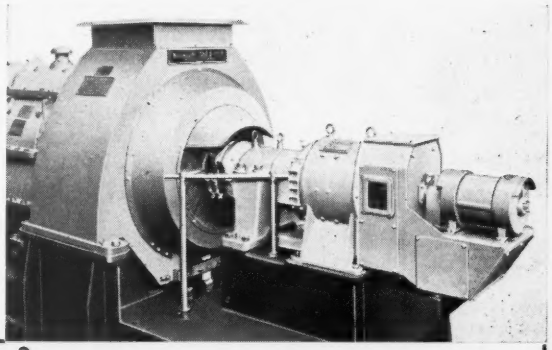

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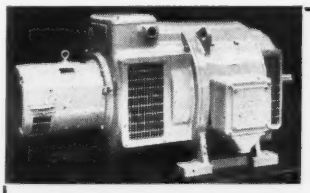

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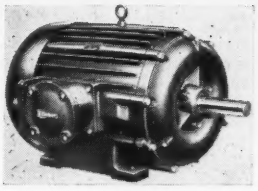

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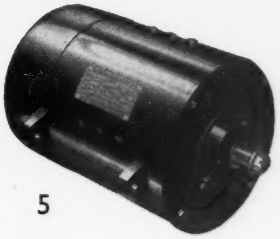

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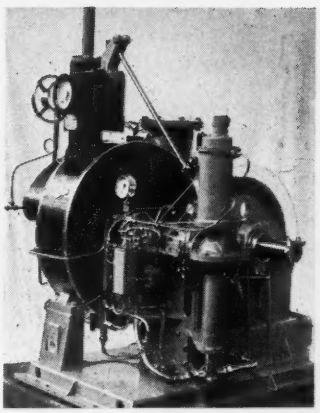

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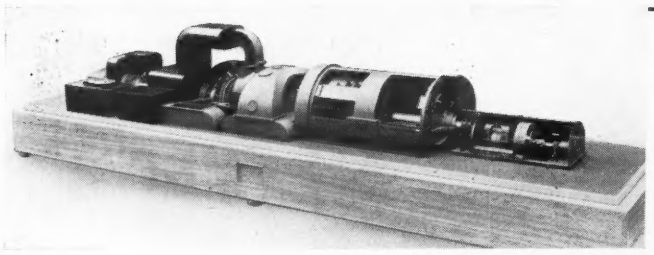
1. 120 MW rotor shaft for Staythorpe by Thos. Firth & John Brown, Ltd. 2. W. H. Allen 600 h.p. marine auxiliary diesel generating set. 3. Crompton Parkinson self-regulating alternator with "Magnicon" exciter. 4. Newman explosion proof motor for the American market. 5. Battery traction motor by Electro Dynamic Construction Co., Ltd. 6. Weir geared turbine for oil pumps



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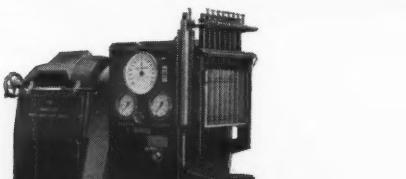

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1. *Scale model of 120 MW 3,000 r.p.m. Metro-Vick turbo-alternator.* **2.** *Thornycroft industrial diesel set.* **3.** *Hartridge heavy duty test bench.* **4.** *Mono " Kwikleen " hygienic pump.* **5.** *Carter electrically driven hydraulic infinitely variable speed gear*

Electrical Co., Ltd. On the general products stand, heavy equipment is represented by two models, one of a large capacity turbo-generator set, and the other of a water turbine driven vertical generator as supplied to Canada. A further exhibit associated with large generators is a section of a water-cooled stator coil. Other equipment includes an actuating mechanism for the control rods of a thermal reactor, a 400 h.p. flameproof motor for the petroleum industry, a Newton Victor industrial X-ray unit, a magnetic crack detector and various types of vacuum pumps.

Prominent on the welding equipment stand is a 36in throat depth air operated spot welder and an automatic arc welding machine adaptable for either submerged arc or open arc welding. The latter is shown in operation as a submerged arc unit. Other exhibits include the latest Metrovick electronically controlled manipulator for loads up to 25 tons, a redesigned rope parting machine, and a display of arc welding electrodes.

DIESELS

The combined exhibit of Ruston & Hornsby, Ltd., and Davey, Paxman, Ltd., includes additions to their gas turbine and locomotive ranges. The new locomotive is a 30-ton Ruston diesel-electric shunter. The driving unit consists of a 208 b.h.p. Paxman engine which runs at 1,250 r.p.m. and is coupled to British Thomson-Houston electrical equipment. It has a tractive effort at starting of 22,000 lb and will haul over 1,000 tons on a straight and level track.

The test bench exhibited by Leslie Hartridge, Ltd., is designed for testing the heavier types of pumps such as are used on marine, large stationary and diesel locomotives. The machine is made for universal employment so that different types and banks of test injectors and calibrated test tubes can be rapidly fitted, thus giving a range of outputs from 0 to 1,000 cu cm in multiples of 100 or more strokes. The pump on test is driven through infinitely variable gearing from a 5 h.p. motor at any speed up to 750 r.p.m., this speed being recorded on a tachometer.

Among the diesel engines which are being exhibited by F. Perkins, Ltd., for industrial and marine purposes with a h.p. range from 18 to 104 h.p. and a speed range from 1,000 to 2,500 r.p.m., mention may be made of the L4 (1) power pack, which has an output up to 53 h.p. at 1,800 r.p.m. This comprises a four cylinder in-line engine with a bore of $4\frac{1}{4}$in and a stroke of $4\frac{3}{4}$in. Its features include a low level camshaft, with easily replaceable pre-finished wet liners. The crankshaft is made from an alloy steel stamping with hardened main and crank pin journals and a serrated front end. The camshaft and fuel pump are gear-driven from the crankshaft. The timing case is a separate casting and is secured to the front end of the cylinder block.

W. H. Dorman & Co., Ltd., are showing a full range of their L series industrial diesel engines. These comprise units with two, three, four, five, six and eight cylinders and are designed for driving electrical generators. The outputs of these sets range from 20 to 160 h.p. and they are of the four-stroke direct-injection water-cooled type. An example is also shown for the first time of the firm's six cylinder Q type engine which is about to be introduced and has a larger range of output.

Typical of the diesel engines on one of the three stands of the English Electric Co., Ltd., is a four-cylinder unit which has been designed for railway duties. It is of the four-cylinder supercharged type with an output of 500 b.h.p. at 850 r.p.m. and is one of 73 similar equipments which are to be used for powering multiple diesel train sets. These sets are to be placed in service between London and Hastings and on the Hampshire lines. The engine is fitted with a control system so that its average engine speed over service periods can be reduced with fluctuating power demands. This results in considerable economies in fuel and lubricating oil consumption and in lower rates of wear. The governor actuates an auto-loading device, which ensures that the generator cannot overload the engine and that the full output is available over a wide range of locomotive speeds. A 2,750 h.p. industrial gas turbine, which is now in batch production, is being exhibited for the first time.

John I. Thornycroft & Co., Ltd., are showing a full range

of their diesel engines among which mention may be made of a set which has been designed for industrial use. This is direct-coupled to a 26 kW, 400/230 V three-phase alternator, the speed of the combination being 1,500 r.p.m. The unit is self-contained and can be fitted with a protective canopy if required.

GEARING, PUMPS AND HOISTS

A recent development in the range of Radicon worm reducers made by David Brown Industries, Ltd., is a combined helical and worm gear unit. This has been designed to deal with the high torque experienced at low operating speeds and thus provide a choice of ratios from 80 : 1 to 250 : 1. Each unit comprises a helical gear first reduction unit, which is coupled to a standard single reduction worm reducer. The self-contained first reduction unit is arranged to give four alternative shaft positions which, in conjunction with the two low-speed shaft locations, provide a choice of eight different shaft handling arrangements. The gear ratio of the helical unit is about 4 : 1, different ratios being fitted to the final reduction unit to obtain the overall ratio required for a specific duty.

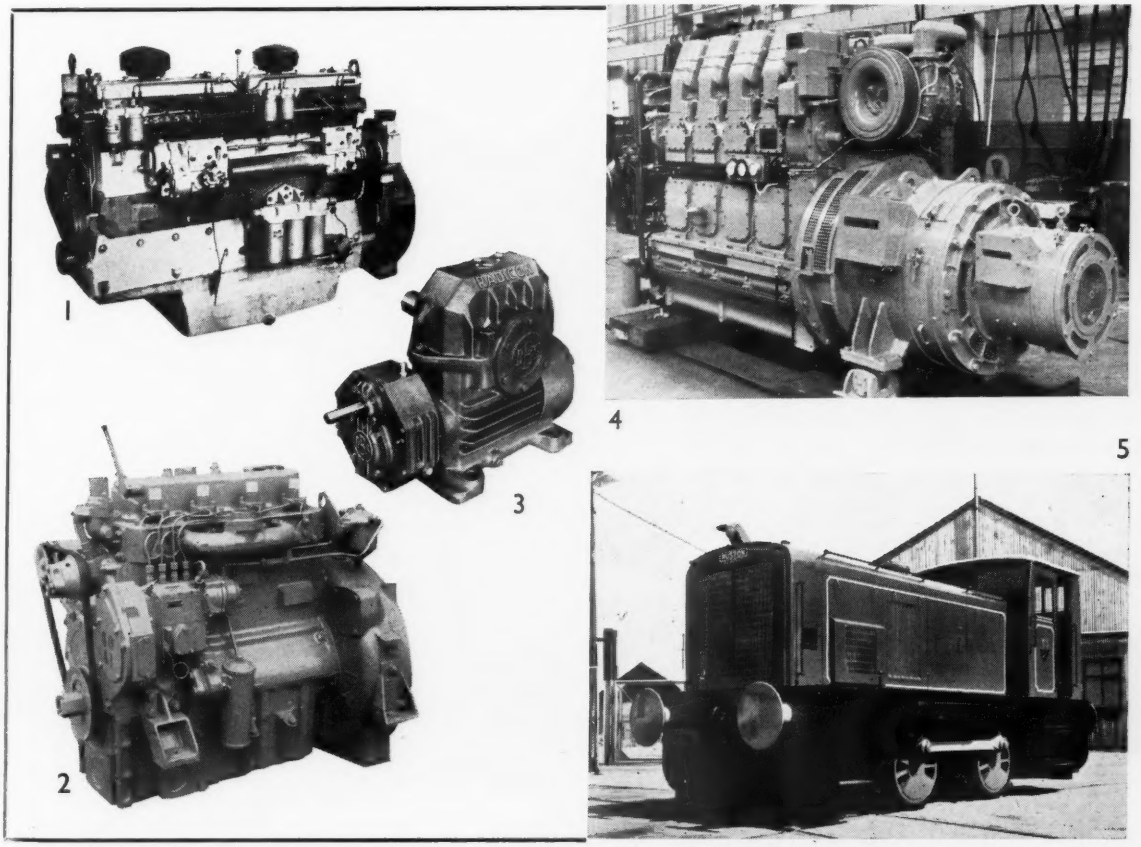
Working models of their hydraulic infinitely variable speed gears are exhibited by Carter Gears, Ltd., to show the principle of their operation, one model being made of metal and " Perspex " and the other almost entirely of " Perspex." These have proved of great value in explaining the outstanding features of the equipment. In addition, examples of both working and static units, which are representative of the ten sizes being manufactured, are being exhibited, and will be used to demonstrate handwheel, remote electrical, lever and hydraulic relay speed control as well as drives employing different arrangements of electric motors.

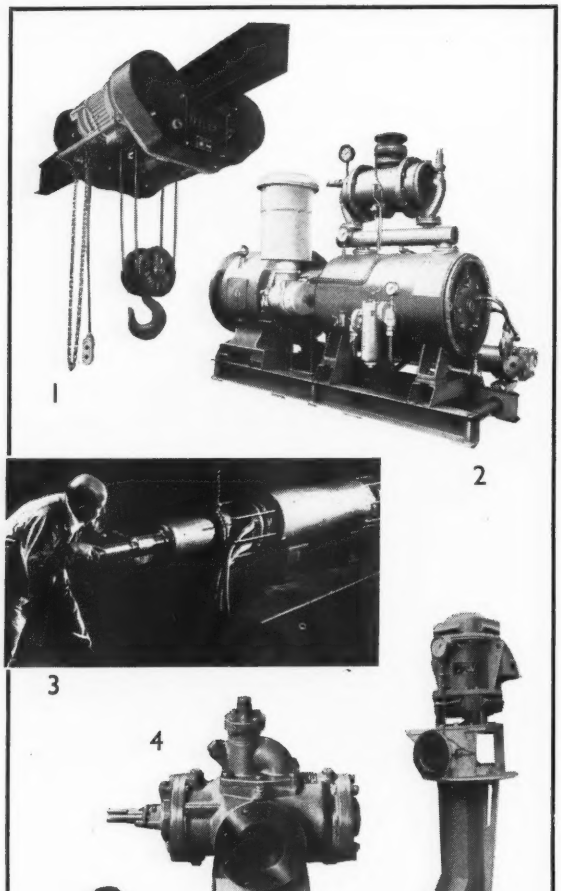
Mono Pumps, Ltd., and Menrow, Ltd., are exhibiting under the collective title of the Mono Group of Companies, the former showing marine, industrial and powder pumps and the latter oil-conditioning plant, industrial filters and oil fuel pumps. In the industrial division is a new hygienic pump known as the Mono " Kwikleen " K63 which is suitable for handling milk and other edible fluid products. It is self-priming up to 25ft and can be used for vacuum extraction duties. It is claimed that its consistent rate of discharge up to 3,000 gal/hr at a maximum pressure of 30 lb/sq in make it ideal for high temperature short-time processing. All the internal surfaces of the pump are of polished stainless steel and the stator is of non-contaminating composition. It can be easily dismantled for sterilisation.

In addition to a variety of centrifugal, reciprocating, marine and vacuum pumps Worthington-Simpson, Ltd., are for the first time exhibiting two machines from a new range of two-stage oil-cooled rotary air compressors. These are of the industrial type and cover capacities from 200 to 1,200 cu ft/min at pressures up to 120 lb/sq in. Basically these compressors are of the same design and construction as the conventional sliding-vane type, the one essential difference being that large quantities of oil are injected. This not only ensures complete lubrication of all the working parts, but also forms an effective seal against air leakage between the sliding vanes of the rotor. A high volumetric efficiency is thus obtained. The oil also acts as an internal coolant and absorbs a high proportion of the heat of compression The result is that the final air temperature is less than 200 deg F. Inter-coolers or after-coolers are therefore unnecessary.

From the mechanical standpoint rotary compressors have

1. Dorman 8-cylinder diesel engine. 2. Perkins 53 h.p. power pack diesel engine. 3. David Brown helical worm gear unit. 4. English Electric four-cylinder diesel engine for railway duties. 5. Ruston & Hornsby 208 h.p. diesel-electric shunter





1. *Felco five-ton short headroom electric pulley block.* 2. *Worthington-Simpson two-stage oil-cooled rotary air compressor.* 3. *Harland submersible pump rotor.* 4. *Hamworthy screw pump.* 5. *Drysdale drowned suction centrifugal pump.* 6. *Sciaky foot-operated spot welder.* 7. *Lincoln semi-automatic welding equipment.* 8. *Hirst automatic indexing machine*

the advantage that all the main working parts subject to wear are replaced by a simple two-stage in-line rotor with non-metallic parts. The absence of valves and reciprocating components also results in smooth running free from vibration and pressure pulsations so that only the lightest and simplest type of foundation is necessary. Finally the higher speeds at which the rotary machines operate enable robust and inexpensive squirrel cage motors to be used for driving.

The new electric wire rope pulley block, which is being shown by Felco Hoists, Ltd., is notable for the exceptionally short head room occupied. It is made in capacities of 3 to 5 tons and is equipped with a 5 h.p. 1,400 r.p.m. totally-enclosed fan-cooled squirrel cage hoisting motor for operation on a 400 V three-phase circuit. This motor is fitted with an electromagnetic brake which is applied by a push-button or when the current is switched off or fails. The travel motor, which is also of the squirrel cage type, is totally enclosed and flange-mounted. It drives the runner carriage through a centrifugal clutch coupling at a speed of 50 ft or 75ft/min, the design being such that there is smooth acceleration on starting. No brake is fitted to this motor. Control is by a pendant push-button switch with double break silver-to-silver interlocked contacts.

The outstanding feature on the stand of the Harland Engineering Co., Ltd., is a Ulectriglide submersible pump set, the standard range of which covers duties up to 950 gal/min and heads up to 1,000ft, the operating motors having outputs up to 130 h.p. These motors are of the squirrel cage pattern, are of the completely wet-type and are designed to give the highest output within a necessarily restricted diameter.

The screw pumps exhibited for the first time by Hamworthy Engineering, Ltd., have been designed to deal with fluids at various viscosities and pressures and have an output up to 100,000 gal/min. The screws are designed so that completely enclosed chambers are formed between the threads. As the screws rotate these chambers move forward in an axial direction without creating turbulence. The screws are hardened and ground on their contact surfaces and are generally carried on bearings which are lubricated by the pump fluid under full pressure.

Drysdale & Co., Ltd., are exhibiting a new type of drowned suction centrifugal pump which is intended to provide forced lubrication for marine services. As there is no suction left the air which is entrained in the oil enters the pump at atmospheric pressure instead of being expanded by vacuum. There is therefore less fall-off in the volume of oil with increased aeration. No fine strainers are required since small solids are prevented from entering the system by filters on the discharge. The use of a centrifugal design reduces the number of components to the minimum.

WELDING

As its title implies, there is a good display of welding machines at the exhibition, many of which are electrically operated. The Lincoln Electric Co., Ltd., are showing six models, one of which, M.L.2, is semi-automatic in operation and is therefore both simple and easy to use. When it is employed high welding speeds are possible, plate perforation is minimised and higher quality results are ensured. A second machine, B10, of similar design, is fully automatic.

The equipment on the stand of Hirst Electronic Development, Ltd., includes an automatic indexing machine for welding small components such as silver contacts to brass and copper backings in electrical switchgear at a rate of one weld every four seconds. A welding current/time meter enables the duration and intensity of the welding currents to be simultaneously indicated. There is also a display of transformers, metal plate rectifiers and reactors.

Fuller Electric, Ltd., are exhibiting a number of "Aseavets" welding machines as representatives in the United Kingdom of Asea Svetsmaskiner A.B. of Stockholm. These include an automatic flash welder with an electrical loading of 150 kVA at 380 V on a 50 per cent duty cycle. The machine is equipped with hydraulic clamps and is designed for welding steel pipes with a maximum external diameter of 5·25in.

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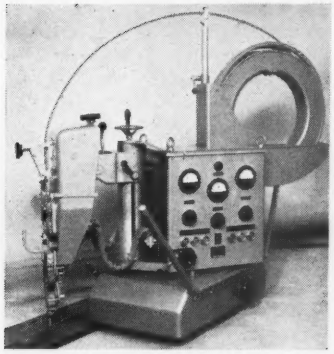

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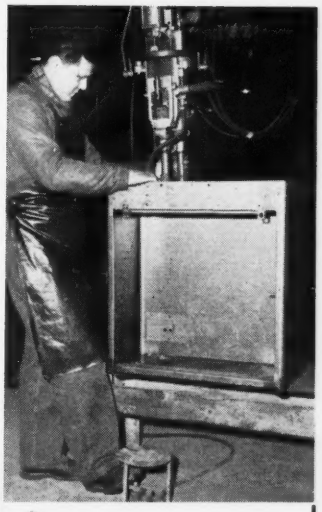

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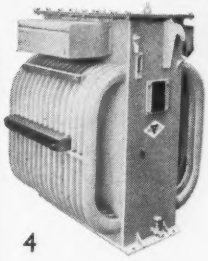

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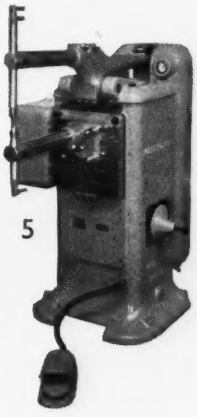

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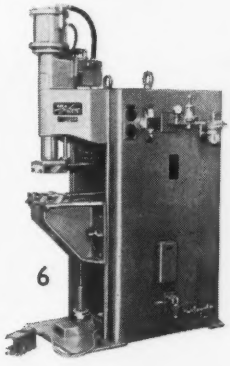

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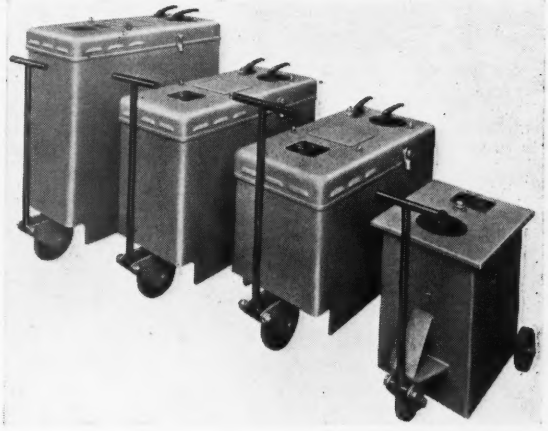


The maximum welding section varies from 3·1 to 3·9in depending on the size of the tube. The welder is equipped with an arrangement for reducing the inside flash produced by the welding operation.

A new foot-operated rocker arm general purpose welding machine with an electrical rating of 15 kVA is being shown by Sciaky Electric Welding Machines, Ltd., for the first time. This has a capacity of 14 + 14 s.w.g. mild steel sheet and greater unequal thickness; for instance, in mild steel wire up to $\frac{3}{16}$in + 18 s.w.g. and 0·25 + 0·25in in diameter. The transformer is air cooled with the copper sections arranged to avoid dangerous temperature rises during continuous working. Heat tappings are provided and control is effected on the primary side by an electromagnetic contactor which is operated by a thyratron timer to give a range of weld times from 2 to 150 cycles. The electrode stroke is infinitely adjustable up to a maximum gap of $2\frac{3}{4}$in. Sufficient electrode force is obtainable by an adjustable spring and various welding pressure settings are available.

The automatic welding machine exhibited by Welding Supplies, Ltd., is designed for welding with continuous coated electrodes and the submerged arc process. In special circumstances, however, a continuous bare electrode without flux can be employed. The machine is capable of working with currents between 300 and 2,000 A and the voltage, welding current and speed of travel can be readily varied from the welding head. The arc welding current is controlled electronically to ensure an even deposit of weld metal.

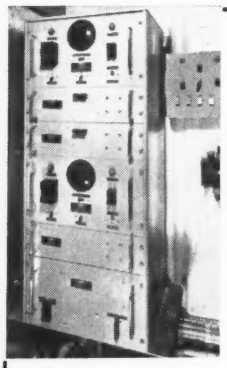
Among the nine machines shown on the stand of Holden & Hunt, Ltd., mention may be made of a 15 kVA rocker arm air-operated spot welder which embodies fully automatic features. There are also two manually operated spot welders and three wire butt welders, the latter being typical of the different sizes of machine made by the firm and the methods of clamping control employed.

A wide range of spot welding guns is being exhibited by the A.R.O. Machinery Co., Ltd. These include one which is air-operated, a special feature being the small cylinder, which enables high quality spot-welds to be obtained at good production rates without fatigue to the operator. It is automatic in action and, like its hand-operated water-cooled counterpart, is fitted with a water-cooled gun which has built-in gyroscopic suspension. Easy rotation through 360 deg in all directions is thus possible.

Murex Welding Processes, Ltd., have introduced a new range of multi-operator welding transformers for use by three, six, nine, twelve or fifteen operators at either 250 or 350 A or by three or six operators at 600 A. The example shown on the stand is suitable for six operators at 350 A. The primary windings are suitable for connection to a 380/440 V three-phase 50 c/s supply. The transformers are housed in boiler plate tanks with elliptical tube cooling.

The equipment shown by F. Bode & Son, Ltd., includes a positioner for welding work with a capacity of 2,240 lb at

1. Positioner for welding work by F. Bode. 2. Welding Supplies automatic welding machine. 3. Automatic water-cooled welding gun by A.R.O. Machinery. 4. Murex multi-operator transformer for arc welding. 5. Holden & Hunt 15 kVA air-operated spot welder. 6. Fuller automatic flash welder. 7. English Electric portable welders



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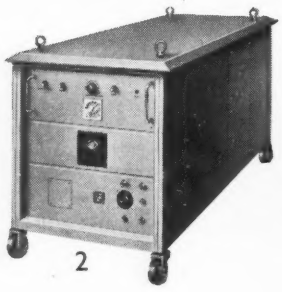

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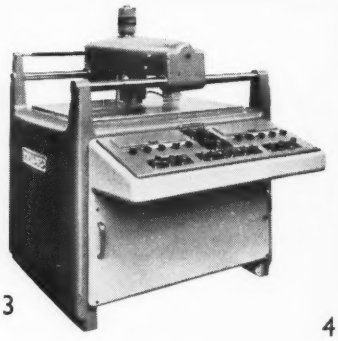

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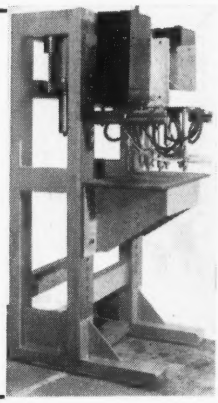

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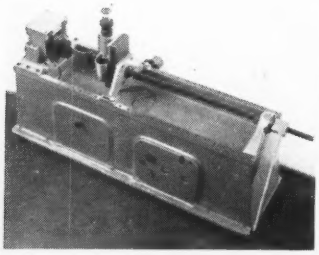

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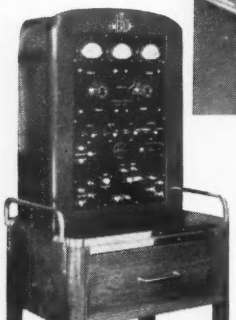

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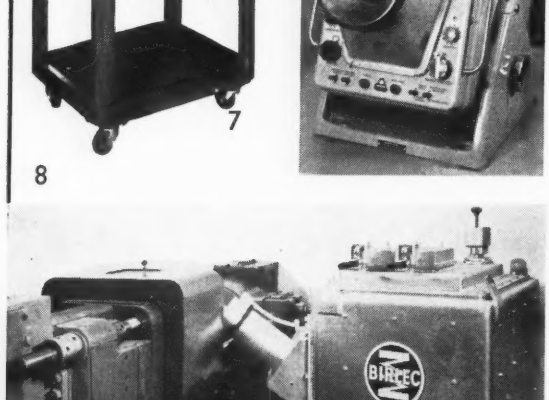


1. *G.E.C. electronic dimmer.* **2.** *Saturn surge injector argon arc welder.* **3.** *Mullard electronically controlled positioning machine.* **4.** *High speed rack welder by Bates & Bates.* **5.** *Avery midget fatigue testing machine.* **6.** *Marconi radar track indicator.* **7.** *Merlin test conversion unit.* **8.** *Birlec furnace for holding and pouring molten aluminium*

9in eccentricity, the turntable of which is equipped with variable speed control. The control of the mechanical rotation of the table is effected electronically or by an English Electric "Magamp," this ensuring a smooth continuous weld and enabling machines to be used in conjunction with automatic or semi-automatic processes. The standard speed range is from 0·031 to 875 r.p.m.

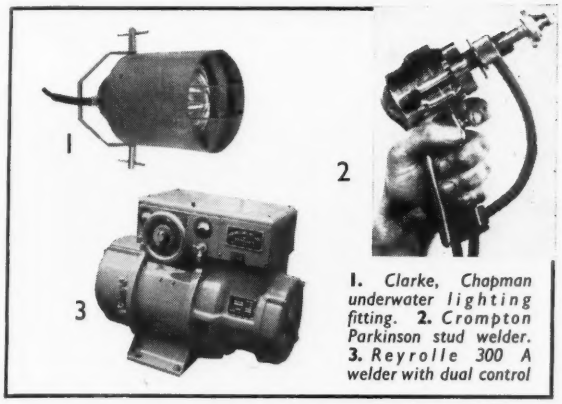
The English Electric Co., Ltd., is exhibiting a wide range of portable welding equipment which includes regulators, a new rectifier and eleven patterns of electrodes. Typical of the welders is the LWC series, the smallest of which is intended for sheet metal workers, agricultural engineers, garages and for light fabrication. This has a current range from 30 to 200 A in 24 steps. The other patterns are suitable for more general purposes. Each unit is of the single operator type and has provision for an in-built capacitor. The new rectifier has been designed to meet the demand for direct-current equipment.

Two new models of their surge injector argon arc welders are being shown by Saturn Industrial Gases, Ltd. Their design shows an improvement over earlier models owing to the use of built-in transformers as this increases their mobility. They are intended for welding aluminium and its alloys as well as stainless steel and the current range is from 30 to 600 A from a 42 V open-circuit alternating current supply. The water and argon supplies are controlled automatically so that the operator is free to concentrate on the welding. The surge injector is fitted with an auxiliary device which feeds a higher voltage spark to strike the initial arc so that "touch starting" is avoided.

In addition to their well established "Nelson" and "Cyc-Arc" welding equipment Crompton Parkinson, Ltd., are exhibiting a new stud welder the special features of which are compactness and lightness. In fact it weighs only just over 5½ lb. The body is built up of two light alloy castings with an integral pistol handle, which encloses the operating coils and an adjustable lifting device. The weld and control cables enter at the heel of this handle. A leg, the length of which can be varied to accommodate attachments up to 3½in long, can be gripped by a clamp ring on the nose of the tool. This leg has a single point foot so that it is interchangeable with the "Nelson" stud-welding tools. The controller consists of a drip-proof sheet steel case, the front of which is recessed to provide protection for the timer control, plugs and sockets and pilot lamp.

A. Reyrolle & Co., Ltd., are exhibiting examples of their single-operator welding sets. These have their control and starter units mounted above the machine frame. A twin-operator generator with fine regulator controls mounted in separate cases for remote control is also being shown. All the welders have drooping-voltage characteristics, the maximum welding ratings ranging from 175 to 425 A with open-circuit voltages of 70 V. Representative of the switchgear displayed is a new 500 MVA, 11 kV horizontal drawout air-break circuit-breaker in which cast resin is used for insulation.

The rack welder shown by Bates & Bates, Ltd., is designed



1. Clarke, Chapman underwater lighting fitting. 2. Crompton Parkinson stud welder. 3. Reyrolle 300 A welder with dual control

so that a range of standard fittings can be mounted on it. Up to eight welds of almost any shape can be made at once from a pair of 45 kVA water-cooled transformers with cast copper secondaries which may be arranged either for series or direct spot welding. The electrode holders are powered by ½ sq in bore single acting hydraulic rams with a stroke of 2in, the return stroke being made by a spring. The output is high, a grid requiring eight spots being assembled and welded at a rate of 15 per min.

HEATING AND LIGHTING

Some of the many applications of electricity to industrial heating in shipbuilding, such as brazing, welding and metal melting, are being shown on the stand of the British Electrical Development Association. These include an electric induction furnace for the production of marine brass and bronze and machines for welding superstructures. Space is also being devoted to a display of electrical auxiliaries in shipyards such as drills, grinders and riveters which do much to expedite this class of work.

One of the latest additions to the range of Birlec, Ltd., is a holding unit for pouring molten aluminium and zinc based alloys. This is being shown in an operation with a machine producing die-castings of the former metal. It is similar in principle to the firm's mains frequency channel type induction melting furnace and is rated at 20 kW. Its rapid automatic operation enables the rate of production of aluminium to be raised to the level achieved with zinc. It is simple to work since once the timing dials have been set the metal is delivered directly into the chamber of the die-casting machine by pressing a button. The consequent elimination of ladling ensures greater efficiency of timing and metallurgical control.

The aluminium underwater lighting fitting which is being shown for the first time by Clarke, Chapman & Co., Ltd., has been manufactured by E. N. Mackley & Co. in accordance with a patent of the Atomic Energy Authority. The lampholder body has a sealed side entry for the cable and is designed in such a way that when the special lamp is screwed into position the alignment is correct. Spring-loaded rubber seals are provided at the neck of the lamp so that it is watertight at the pressures experienced down to a depth of 1,500ft. A guard is fitted to give protection under working conditions and all the aluminium parts are anodised.

The General Electric Co., Ltd., are showing a representative display of the equipment they manufacture for auxiliary power, lighting, catering and ventilation on board ship. A special lighting exhibit shows colour-change and dimming effects with cold cathode tubes. This is controlled by an all-electronic dimmer which enables the range of dimming obtainable to be virtually the same as that available with resistance control of tungsten lamps. At the same time advantage is taken of the high efficiency of the fluorescent tubes. The installation consists of four lines of cathode tubing—red, blue, green and de luxe warm white—which form a circle 11ft in diameter in a cornice arranged to illuminate a dome. Colour changes are made with the coloured tubes, the warm white being added to produce pastel colours.

INSTRUMENTS

Instruments are well represented at the exhibition either as separate items or as showing the part they play in the efficient operation of other equipment. Examples of marine radio, radar and other electronic devices are, for example, shown on the stand of the Marconi International Marine Communication Co., Ltd. These include the latest radar track indicator which is fitted to the firm's "Radiolocator IV" and gives the navigator the choice of true motion or "conventional" radar displays. Another item which is being shown for the first time is the Marconi-Postan "protector equipment" which is designed to discourage the adhesion of barnacles and other marine growths to the underwater plating of a ship's hull by electronic means.

A feature of the exhibit of Mullard, Ltd., is an electronically controlled automatic co-ordinate positioning machine. This has been designed for use in those engineering industries where precision work on sheet materials is a standard practice. It automatically marks out, drills and plots on any kind of sheet material up to 24in wide and of any length, simply by setting up the appropriate X and Y co-ordinates on the respective dials. Ultrasonic generators, together with transducers, are also being displayed by the firm to illustrate their use for cleaning and de-sealing, soldering aluminium and alloys and drilling irregularly shaped holes to fine tolerances in hard and brittle materials.

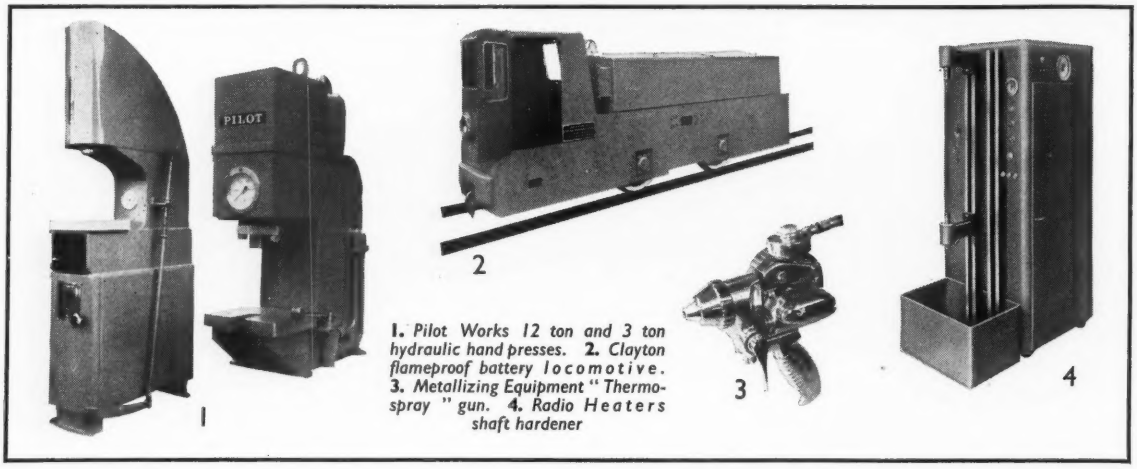
W. & T. Avery, Ltd., are exhibiting a midget "Pulsator" machine for the fatigue testing of steel, cast iron, light alloys and non-ferrous metal specimens as well as separate machine parts under axial loading conditions. The alternating load that can be applied varies equally on either side of zero from about 25 lb to 330 lb, the frequency being 2,800 cycles per minute. A steady comprehensive or tensile stress due to an initial flexure of the main leaf up to 700 lb can be superimposed on the completely reversed stress. It is also possible to exert pulsating stresses between zero and a maximum value so that the resultant load will oscillate between zero and 660 lb, the latter value being composed of 330 lb of static and 330 lb of dynamic load. The loading can be either compressive or tensile.

The machine is driven through an eccentric with an adjustable throw by a ¾ h.p., 415 V fan-cooled motor. The eccentric is, in turn, linked through a connecting rod to an elastic leaf spring which amplifies the alternating load. The specimen is secured by grips to a moving headstock at one end and at the other to a dynamometer, consisting of an elastic steel ring and a reading microscope. The dynamometer deflection under load is indicated by a narrow band of light, which is superimposed on a magnified graduated scale within the microscope. An automatic switch, near the headstock, cuts off the current if the specimen breaks. The number of reversals applied to the load is indicated on a counter mounted on the driving motor.

The electrical test conversion unit shown by Merlin Engineering Co., Ltd., has been designed so that tests can be made on the equipment of road vehicles and is used in conjunction with the firm's "Calimaster" diesel fuel pump test machines. It comprises a single drive which can be employed for both types of test, thus achieving considerable economy.

MISCELLANEOUS

Two new presses are being exhibited by Pilot Works, Ltd. One is a 12 ton hydraulic press with a work table of 12in by 12in by 2in and a daylight stroke and thrust of 12in, 6in and 12in respectively. Control is by a foot pedal or alternatively by pressure valve, which is adjustable from 0 to 12 tons. Under load the travel speed is ¼in per sec with a return of 4 sec. Driving is effected by a 2 h.p., 440 V



1. Pilot Works 12 ton and 3 ton hydraulic hand presses. 2. Clayton flameproof battery locomotive. 3. Metallizing Equipment "Thermospray" gun. 4. Radio Heaters shaft hardener

motor. The other exhibit is a 3 ton hand press, which is driven by a ½ h.p., 440 V motor providing an under-load speed of ⅜in per sec with a return speed of 1½in. Control is by hand lever.

A new thermospray process is being exhibited by the Metallizing Equipment Co., Ltd. It enables high melting point ceramic materials, hard-facing alloys, stainless steel and bronze, to be deposited at high speeds. The gun used for this purpose is of relatively simple design since no compressed air is required for its operation. Maintenance is therefore low. The thermal efficiency of the gun nozzle is such that the material being sprayed is heated efficiently and the supply of powder is regulated by a siphon jet. When ceramic materials are being sprayed an electrically operated vibrator is fitted to ensure a smooth flow.

A new induction shaft hardening machine is being shown by Radio Heaters, Ltd. It is available in three sizes with 2ft, 4ft or 6ft traverses and in its simplest form consists of a bed with centres between which the component can be accommodated. The component can also be rotated while it is being traversed. The radio frequency work coil or concentrator is mounted on the traverse bed and is moved over the component. Quench and process timers are provided to control the dwell, hardening and quenching cycles. The drive is hydraulic and is controlled by valves in the framework of the unit, where the auxiliary equipment for controlling the radio frequency generator is also placed.

Among the exhibits on the stand of the Clayton Equipment Co., Ltd., is a 10 ton flameproof battery locomotive. This is driven by two 25 h.p., 180 V d.c. motors which are supplied from an "Exide Ironclad" battery with an output of 384 Ah at the five hour discharge rate. The normal drawbar pull is 2,500 lb and the maximum 5,000 lb, while the speed is 6 m.p.h.

Injuries Caused by Fellow Employees

By F. E. SUGDEN

HIGH spirits and horseplay among apprentices are, of course, very common but there may be serious consequences. A High Court case recently arose from such causes and it may serve as a warning to employers, particularly as the same kind of thing may result from any workers' pranks.

Briefly, the facts of the case were these: the plaintiff (an electrical apprentice) while at work was injured through a practical joke played on him by "C," a fellow workman. Over a period of years "C" had been in the habit of indulging in horseplay during his work at the expense of the plaintiff and other employees. The employers knew of "C's" conduct and had frequently reprimanded him, warning him that someone might one day be hurt. Although "C" took no notice of these warnings he was allowed to remain in employment.

The plaintiff brought an action against his employers claiming damages for negligence at Common Law and the High Court came to the conclusion that they were liable to the plaintiff in damages for breach of their duty at Common Law to provide competent workmen. The Court contended that if a workman by his habitual conduct was likely to prove a source of danger to his fellow workmen it was the employers' duty to remove that source of danger. The plaintiff's injury was sustained as a result of the employers' failure to take proper steps to put an end to "C's" horseplay or to remove him from their employment if he persisted in it.

I am sure that it was not in the judge's mind to penalise occasional fun in works, particularly amongst apprentices, so long as it was not injurious to others and did not become a nuisance, but there must be limitations to practical jokes. In this connection I should like to quote another case for the guidance of employers. In this instance a High Court judge held that employers were liable for injury caused to the plaintiff, a boy of sixteen years, through the conduct of two apprentices who by the misuse of a compressed air pipe injured the plaintiff.

The case went to the Court of Appeal and the late Lord Justice Singleton, in allowing the appeal of the employers, said that the defendants had no reason whatever to anticipate that the apprentices would use the compressed air pipe so as to injure the plaintiff. He also remarked that the two apprentices had never done this sort of thing before. The duty of an employer towards his employees was to take reasonable care for their safety and the evidence in this case did not disclose any negligence by the employers. The injury to the plaintiff resulted from wilful misbehaviour by the other two boys which the employers had no reason to foresee.

VIEWS on the NEWS

By REFLECTOR

DOUBTS have been expressed about the strict legality of the system adopted by the North Western Electricity Board of delivering consumers' accounts by hand—an example which the London Electricity Board proposes to follow. The subject is discussed by the Industrial Correspondent of the *Manchester Guardian* who, after dealing with the Postmaster General's monopoly of mail deliveries, says that in general it is assumed that a commercial undertaking is entitled to deliver its own letters or to employ an agent to do so, but that it would not be allowed to employ an agent if that agent was also delivering, or offering to deliver, letters for someone else. This, the correspondent says, would probably prevent Gas and Electricity Boards from operating a combined account delivery service.

* * *

Quite a stir has been caused by the adoption of this "Do it Yourself" principle by some Electricity Boards. Some people have indignantly maintained in the newspapers that the Boards are skimming the cream off Post Office business and that this could ultimately mean higher postal charges. It seems to me that the "cream" is provided by the Boards anyhow and if they decide to skim it themselves instead of leaving it to the Postmaster General they are acting within their rights, If by delivering their own accounts they save money it is the public's money. The subsidisation of long-distance postal deliveries by local services has come to be accepted but is this just and is there not a case for lower local delivery charges?

* * *

A correspondent has come across a strange item published in the *Lincoln, Rutland and Stamford Mercury* of 26th October, 1821, a copy of which he has sent me, suggesting that the device mentioned anticipated Faraday's by some years. I hardly think that it did. The note reads as follows:—

> "Perpetual Motion—A very curious piece of mechanism was exhibited at Whitehaven during the last 10 days, which has been in motion during the last five years, with only one interval (as we are assured, and believe to be a fact). It consists of only one small horizontal wheel, not exceeding three-fourths of an inch in diameter, through the centre of which, on the plane of the wheel, passes a small magnetic bar, projecting about three-fourths of an inch beyond the circumference of the wheel on one side, and about three-eighths of an inch on the other side. These projections are called the North and South Poles. The axis of the wheel is, of course, perpendicular. Its operative power is magnetism. Its motion (probably owing to the friction inseparable from the long-continued action of the axis in its sockets) is somewhat irregular; but, on the whole, it is a curiosity highly deserving attention. We are sorry to add, that, owing to a sudden shock which the delicacy of the adjustment was but ill calculated to bear, its motion was stopped entirely the other day, and we have not been able to learn whether it has yet been restored. About two years ago it stopped by some unknown cause, but, after a short pause, recovered its motion of itself, without any additional impulse, and continued its rapid revolutions without intermission till it met with the accident as above mentioned."

* * *

Looking through last week's *Board of Trade Journal* I came across an item dealing with a special levy on imports into France and in a list of items exempted from the levy I saw "electric current." So far we in this country have not regarded electricity as an interchangeable commodity but when the cross-Channel cable is in operation we shall realise that it can be. I wonder what the Board of Trade's attitude will be then? Will "French" electricity be allowed in duty free or will it be subject to import dues? Probably as exports and imports will be roughly equal commonsense will dictate freedom of entry. Of course the Board of Trade may remember that in earlier days it had charge of electricity supply; indeed it gave its name to the "unit." Will the Board seek to resume this connection in a new capacity?

* * *

A sad story of female ingratitude has appeared in the *Oxford Mail*. A Southern Electricity Board wayleave officer was visiting a lady landowner to secure her agreement to the erection of a line over her property. At that moment some bees in a swarm had fallen into a pond and the lady asked the wayleave officer to help her to rescue them. This he did at the peril of his skin. But the lady refused to grant the wayleave which no doubt stung him to the quick although he had handled the bees without damage.

* * *

Half a century ago telegraph poles were subject to as much disparagement as "electric pylons" are to-day. But they, too, had their defenders. The *Electrical Review* of 30th August, 1907, quoted a writer in the *Daily Telegraph* as follows:—

> "A man who cannot see the nobility of the long line of tall giants crossing the bare shoulder of a distant hill has little of the artist and nothing of the poet in his constitution. Silhouetted against a sunset, they have their own especial value, and modern artists have not failed to see their beauty in less obtrusive places. They form a black thread in the embroidery of Nature, and only those who have studied embroidery know of what infinite use that black line is in art. It must be used sparingly as gold but its effect is as noble, and more refined. . . . No artist, except your early Victorian dilettante, would dare to leave that out. I have known men wilfully and with vast wisdom aforethought put them in where they never were."

NEW BOOKS

The General Theory of Electrical Machines. By B. Adkins. Pp. 235; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 45s.

The author of this book has had many years' experience as a designer and consulting engineer dealing with electrical machines, and thus is very well qualified to present a book on the theory of rotating electrical machines. Books on electrical machine design usually deal separately with each type and, whilst this method has produced very successful results in the past, it may present difficulties in the solution of problems associated with the newer types of machines which are coming into use. This is particularly the case when unusual and transient operating conditions have to be considered in detail.

The aim of this book is to present a general theory of rotating electrical machines which is applicable to all types in which alternate magnetic poles are formed round a cylindrical surface. The methods of analysis of various types of d.c. and a.c. machines are explained; appropriate transformations of the variables are made, where necessary, as explained in the various chapters, so that the equations of the various types of machines can be expressed in the same form.

This system is particularly useful in the solution of various problems which may arise under transient conditions, such as the sudden short circuit of a d.c. generator, the starting conditions of an a.c. motor, short circuit of an alternator, synchronising and the like. The presentation should interest lecturers on electrical machines, machine designers, and serious students. Whilst the approach to the subject may be unfamiliar to many readers, an excellent bibliography is included to assist those wishing to consider the matter further.—J.L.W.

Vorschaltgeräte und Schaltungen für Leuchtstofflampen. By Dr. Engr. Carl Heinz Sturm. Pp. 332; figs. Buchhandlung George Kobes, Mannheim. Price DM. 5.25.

To keep abreast of technical developments, this pocket manual on ballasts and connections for fluorescent lamps, first published in 1952, now appears in its third revised edition. The author is chief engineer at the Eberbach works of Brown, Boveri & Cie. A.G., who are responsible for the book.

Books on discharge lamps and fluorescent lighting are generally directed to physicists or technicians seeking information on their construction or use but, in this case, the purpose is to show electricians the characteristics of low-pressure and low-voltage fluorescent lamps and provide advice on planning and executing such installations. This is achieved by numerous tables and wiring diagrams affording guidance on various alternatives for the necessary calculations. Electro-technical problems are dealt with fully whilst illuminating efficiency and economic aspects receive sufficient attention to present an overall survey of the fundamental principles.

American, Swiss and Swedish literature, as well as publications by German and foreign makers of lamps, are acknowledged as valuable sources of inspiration, but results of the author's own research also support the information which is related to commercially available equipment and German standard specifications.

Explanations and technical data on lamps, starters, ballasts and intensity control occupy about three-quarters of the book. The remainder carries on with practical features requiring special consideration for this type of illumination followed by observations on its application to the interior lighting of vehicles and automatic control. As lighting planning itself is well covered by many other books, the author confines himself to the most important data and general advice on calculations for interior and exterior work. The inevitable query as to costs compared with other systems is not overlooked nor are certain doubts about possible effects on health and bleaching of coloured materials. Although the use of low-voltage fluorescent lamps for ultra-violet bactericidal radiation is a matter for experts, it is just outlined in some concluding notes.

The treatment given to the subject is well designed for consultation on technical information and recommendations for practical application.—L.M.B.

Voltage-Stabilised Supplies. By F. A. Benson. Pp. 370; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.1. Price 50s.

There is an increasing demand for the voltage of a.c. supplies for certain purposes to be regulated to within very close limits. In the calibration of electronic instruments, for example, the supply voltage should not vary by more than 0·01 per cent or so. Other equipments where this matter is critical are electron microscopes, sources of illumination, photo-electric apparatus, high-frequency oscillators, and electronic protective gear for power lines.

The author has enlarged upon an earlier monograph on the same subject published in 1950 and has embraced much work done in this field since then.

Stabilisers employing glow discharge tubes are dealt with initially and the comparatively new corona stabilisers for higher voltages are discussed. Thermionic valve circuits are covered and some detailed studies analysed. A useful chapter deals with the various types of standard cell and accumulator batteries used as reference voltages; and magnetically saturated elements are mentioned as well as numerous other miscellaneous types.

This is basically a specialist work and those concerned will find that not only is the existing field of knowledge well surveyed and arranged, but that an excellent set of references, more than 1,000, is provided.—H.R.M.

BOOKS RECEIVED

Basic Mathematics for Radio and Electronics. By F. M. Colebrook, B.Sc., D.I.C., A.C.G.I., and J. W. Head, M.A.(Cantab.). Pp. 359; figs. Published for *Wireless World* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 17s 6d.

U.H.F. Tubes for Communication and Measuring Equipment. By Members of Philips Electron Tube Division. Pp. 62; figs. Price 9s 6d. **Tube Selection Guide 1956-57.** Compiled by Th. J. Kroes. Pp. 111 (approx.); tables. Price 9s 6d. **Tubes for Computers.** By Members of Philips Electron Tube Division. Pp. 53; figs. Price 9s 6d. Philips' Technical Library books, distributed by Cleaver-Hume Press, Ltd., 31, Wright's Lane, Kensington, London, W.8.

Newnes' Slide Rule Manual. 6th Edition. By F. J. Camm. Pp. 112; figs. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 7s 6d.

Introduction to Printed Circuits. By R. L. Swiggett. Pp. 101; figs. John F. Rider Publisher Inc., New York. Chapman & Hall, Ltd., London. Price 21s.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Metropolitan-Vickers Electrical Co., Ltd., announces that **Mr. B. G. Churcher,** M.I.E.E., is relinquishing his position as manager of the Research Department but will continue to act in an advisory capacity. He is succeeded as manager of the Research Department by **Mr. J. M. Dodds,** O.B.E., M.A., B.Sc., B.Sc.(Eng.), Dr.Ing.(Aachen), F.Inst.P., M.I.E.E., A.M.I.Mech.E.

Dr. Dodds joined Metropolitan-Vickers in 1928 as a college apprentice, subsequently working in the company's research department as a physicist in the radio laboratory and later as group leader of the electronics group. He was appointed assistant manager of the Research Department in 1954.

Mr. M. Bird, A.M.I.E.E., has been appointed superintendent of the Metropolitan-Vickers Insulation Department and Bury factory; **Mr. D. B. Johnston,** B.Sc.(Eng.), A.M.I.E.E., assistant superintendent, Plant Department; and **Mr. N. Bradshaw** assistant superintendent, Foundries and Pattern Shop.

Mr. Bird joined the company as an apprentice in 1911 and received his technical education at the Salford Royal Technical College. After serving in the Royal Engineers during the first world war he returned to the company and has held various positions in the Insulation Department, leading to his appointment as assistant superintendent in 1945.

Mr. Johnston received his technical education at Northampton Engineering College, London, and after service with the armed forces he joined Metropolitan-Vickers as a college apprentice in 1949, subsequently continuing in the company's Plant Department as development engineer and later as manufacturing assistant.

Mr. Bradshaw joined the company as an apprentice pattern maker in 1935 and has been general foreman of the Pattern Shop since 1956. He received his technical education at Old Trafford Technical Institute and Manchester College of Technology.

Mr. H. C. Young relinquishes his duties as superintendent, Erection Department, Metropolitan - Vickers Electrical Co., but remains with the company as consulting engineer. **Mr. A. P. Mitchell** is appointed superintendent, Erection Department, **Mr. W. Harper** assistant superintendent (switchgear), Erection Department, and **Mr. A. D. Millar,** assistant superintendent (plant), Erection Department.

Mr. P. O'B. Hove, B.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E., has been appointed by the Metropolitan-Vickers Electrical Export Co, Ltd., as resident manager, Middle East. He will operate from Baghdad, Iraq.

Mr. Hove received his technical education at London University and joined Metropolitan-Vickers in 1938. After five years in the company's Motor Engineering Department and two years in the Mechanical Sales Department, he joined the M-V Export Co. (Eastern Division) in 1945. He was the Export Company's representative in China from 1949 to 1953. Since 1954 he has been based in London, travelling extensively abroad in connection with the export business of the Instrument and Meter Department.

Crompton Parkinson, Ltd., announce that **Mr. H. Astbury,** M.I.E.E., having reached normal retiring age, has relinquished his appointment as chief engineer which he has held since 1945. He will, however, continue with the company in an advisory capacity. He is succeeded by his deputy, **Mr. W. A. McNeill,** B.Sc.Tech., M.I.E.E.

Mr. Astbury was an apprentice in the works and drawing office of Siemens Bros. Dynamo Works, Ltd., Stafford, between 1911 and 1914. He served with the Forces until 1915 when he joined the B.T.H. Co. at Willesden. In 1919 he returned to Siemens Bros. as a switchgear engineer and on the amalgamation of the company he was transferred to the English Electric Co., subsequently becoming assistant sales manager for switchgear at Stafford. He joined Crompton Parkinson in 1928 as manager of the Switchgear Department, and in 1945 was appointed chief engineer of the company with special reference to development and research. During his time as chief engineer he was responsible for the construction of the high power testing station at Chelmsford and subsequently for the building, also at Chelmsford, of the company's general research laboratories, the latest extension to which was occupied at the end of last year.

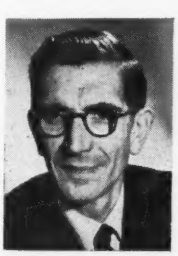
Mr. H. Astbury

Mr. W. A. McNeill

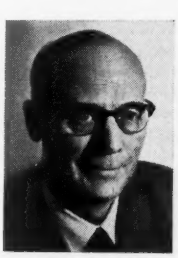
Mr. Astbury is a member of the E.R.A. Council and was its chairman for three years. He is a member of several B.S.I. technical committees, B.E.A.M.A. committees and the British National Committee for C.I.G.R.E. He is also a governor of the Mid-Essex Technical College and chairman of its Science Advisory Committee.

Mr. McNeill joined Cooke & Ferguson, Ltd., an associate company within the Crompton Parkinson group, as chief engineer in 1949. In 1956 he was appointed deputy chief engineer of Crompton Parkinson, Ltd., and deputy manager of the Development and Research Department.

Beginning his career with the Metropolitan-Vickers Electrical Co., Ltd., Mr. McNeill later served with Ferguson Pailin, Ltd. After several years of specialisation on circuit-breaker design and short-circuit testing, he was appointed chief electrical research engineer to the latter company in 1942. Before joining Cooke & Ferguson he was for a short time chief switchgear engineer with the Brush Electrical



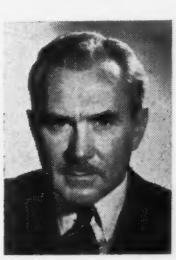
Dr. J. M. Dodds



Mr. M. Bird

Mr. D. B. Johnston

Mr. N. Bradshaw



Mr. P. O'B. Hove

Engineering Co., Ltd. At the I.E.C. Conferences in Philadelphia in 1954 and in London in 1955 he was leader of the British delegation of the Low Voltage Switchgear Committee.

Thorn Electrical Industries, Ltd., announces the appointment of **Mr. W. P. Williams** as service manager to Tricity Electric, Ltd., Enfield, which is responsible for the servicing of domestic equipment and the supply of spares. For the last 7½ years Mr. Williams has held the position of branch technical manager with Hoover, Ltd.

Mr. W. P. Williams

Mr. P. J. H. Coates, A.M.I.E.E., who was recently appointed a director and general manager of Veritys, Ltd. (see *Electrical Review,* 14th June) has now become managing director. **Mr. J. W. Seymour,** B.Sc.(Eng.), has been appointed a director of the company.

Mr. V. C. H. Creer has acquired a controlling interest in Superlamp, Ltd., electrical and radio wholesalers, London, from Mr. P. F. Stanton, who will remain on the board for the time being. Mr. L. G. Lyon (general manager) and Mrs. S. Bryant, who are directors of the company, will continue in their present duties. Mr. Creer was formerly a director of the British Thomson-Houston Co., Ltd., and then joint managing director (until last November) of the A.E.I. Lamp & Lighting Co., Ltd.

Mr. J. W. Atwell, M.Sc., M.I.Mech.E., has been appointed assistant managing director of the executive board at Cathcart of G. & J. Weir, Ltd. Mr. Atwell joined Weir's as works manager in 1954 and has been works director since the formation of the executive board in 1955.

Mr. L. Roullier, A.M.I.E.E., M.E.I.C., A.Amer.I.E.E., has been appointed head of the recently formed Electrical Division of Aluminium Laboratories, Ltd., Banbury. For this appointment Mr. Roullier was transferred from Aluminium Union, Ltd., London, where he was engaged on development engineering associated with the use of aluminium in electrical apparatus. Before joining the Aluminium, Ltd., group in 1954 he held an appointment for six years with Johnson & Phillips, Ltd., with whom he served a post-graduate apprenticeship course, and was afterwards engaged on development and contracts work in the United Kingdom and Pakistan.

Mr. L. Roullier

Mr. H. E. Cornish, O.B.E., M.C., B.Sc.(Eng.), A.C.G.I., M.I.E.E., former Postmaster General of Sarawak, has been appointed general manager of British Telecommunications Research, Ltd., the research establishment jointly sponsored by the Automatic Telephone & Electric Co., Ltd., and British Insulated Callender's Cables, Ltd., at Taplow. Mr. Cornish succeeds Sir Archibald Gill, who now becomes chairman of the company.

The Electric Lamp Industry Council has now replaced the Electric Lamp Manufacturers' Association as a constituent of the Electrical Fair Trading Council and **Mr. J. G. Christopher** and **Mr. W. J. Jones,** respectively chairman and director of the E.L.I.C., represent that body on the Fair Trading Council. **Mr. J. H. Campion,** secretary of the Electric Light Fittings Association, has been appointed as a representative to serve on the Fair Trading Council.

Mr. J. H. Richardson has retired from the board and the service of Bertram Thomas (Engineers), Ltd., after forty-seven years with the company and he has been presented with a cocktail cabinet by Mr. Eustace Thomas (director) on behalf of the employees.

Mr. J. H. Richardson

The August meeting of the **A.S.E.E. Golfing Society** was held at Kingswood Golf Club when a bogey competition was played for the Founders' Mug and the President's Prize. The next meeting is at Mill Hill Golf Club on 10th September. The secretary's new address is 45, Hawkes Road, Kingston-on-Thames.

Mr. V. H. F. Hopkins, M.I.Mech.E., has been appointed manager of the Engineering, Diesel Engine Division, of the English Electric Co., Ltd., directly responsible to the general manager, Mr. A. V. Wilkin.

Mr. Hopkins received his early training at Portsmouth and in London where he served an apprenticeship in mechanical engineering with the Low Engineering Co., Ltd. He graduated at King's College, University of London, in 1932. Subsequently he served with Alfred Wiseman, Ltd., C.A.V.-Bosch, Ltd., and Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., becoming chief engineer and general manager of the last-named company. After the war, he led a British Intelligence Objectives Sub-committee team (representing the Admiralty and British Internal Combustion Engine Research Association) formed to investigate the German diesel engine industry.

In 1948 Mr. Hopkins rejoined C.A.V., Ltd., as general sales manager of the Diesel Department, which position he held until 1951, when he was appointed group chief engineer for Marshall, Sons & Co., Ltd., Gainsborough, and John Fowler & Co. (Leeds), Ltd.

Mr. Hopkins is a member of Council of the Institution of British Agricultural Engineers. He has served on various committees and panels of the British Internal Combustion Engine Research Association, and as a member of Council of that body.

OBITUARY

Mr. G. F. Russell, group cost accountant of the Telegraph Construction & Maintenance Co., Ltd., died on 19th August at the age of fifty-two. He joined the Telcon organisation in 1936 and was appointed cost accountant at the Greenwich Works in 1938. He became group cost accountant in April last.

Mr. F. Crush.—The death occurred on 18th August, at the age of seventy-one, of Mr. Frederick Crush, who was manager of the Ipswich branch of the General Electric Co., Ltd., for thirty-two years before his retirement in 1950. He joined the company in 1909 and worked at the London office before going to Ipswich in 1918. He was a founder-member and for a time hon. treasurer of the Ipswich and District Electrical Association.

Mr. S. O. Bowker, founder-director of S. O. Bowker, Ltd., died on 22nd August at the age of sixty-nine. His death occurred suddenly at Worthing where he had been living in retirement for the past four years owing to ill-health which did not, however, prevent him from taking a keen interest in the activities of the company.

WILLS

Mr. W. S. Gearing, M.I.E.E., London manager for Johnson and Phillips, Ltd., who died on 5th January last, left £4,823 gross (£4,733 net).

Dr. G. E. Foxwell, C.B.E. hon. secretary and a past president of the Institute of Fuel, who died on 26th April, left £17,768 gross (£16,423 net value).

Mr. A. Abbott, A.M.I.E.E., chief construction engineer, Ferguson Pailin, Ltd., from 1919 to 1930, who died on 5th June, left £2,408 gross (£2,353 net value).

Mr. E. M. Jones, founder of Jones, Morris and Co., Ltd., electrical contractors, Manchester, who died on 12th December last, intestate, left £6,704 gross (£5,961 net).

Mr. E. S. S. Hennen, district manager of the Midlands Electricity Board, who died on 14th March, left £4,692 gross (£4,622 net value).

Mr. F. H. Reeves, chief accountant of the Marconi group of companies, who died on 14th June last, left £17,976 gross (£17,867 net).

Mr. S. N. Warren, managing director of Erimus Electrical Factors, Ltd., who died on 16th July, 1956, left £2,100 gross (£1,322 net).

INDUSTRIAL NEWS

New Engineers' Guild Policy

The Engineers' Guild was formed "to promote and maintain the unity, public usefulness, honour and interests of the engineering profession." In furtherance of these objects the Council of the Guild has formulated "a new and progressive policy." First of all it proposes to establish a definition of the engineering profession and then bring about the acceptance of this definition by the Government, industry and the public. It will also take all possible steps to ensure that professional engineering positions are filled by persons embraced by the definition.

The Council is to undertake a survey of salaries and conditions of service in the engineering profession and compile statistics on related matters, such as salaries in other fields, the cost of living and taxation. It is hoped by publicising the results of the survey and drawing attention to anomalies to assist efforts to remove the anomalies and reduce the cost of living and rates of taxation.

Because it is felt that the engineer is not employed in management to the extent warranted by the increasing complexity of modern industry and the importance of the engineer's contribution, the Council aims at encouraging the engineer to equip himself for management and administration. It seeks to ensure that no restriction is placed on the opportunities for engineers to occupy the highest management positions.

A public relations programme is to be carried out to acquaint the public with the work and responsibilities of the engineer and to secure for him the proper recognition.

To meet the cost of pursuing the new policy it will be necessary to raise the subscriptions of members and associates by £3 and £1 respectively as from 1st October next.

Brush Group's £1,250,000 Order

The Brush Group has beaten American, German, Italian, French, Dutch and Japanese competition to get a £1,250,000 order from Argentina for generating plant. The order, which was announced in Buenos Aires last week, has been awarded to the Brush Group following a sales visit to South America by the company's area sales director, Brigadier L. Bootle-Wilbraham.

The order is for generating sets from 100 to 1,000 kW; these will be made by Mirrlees, Bickerton & Day, Ltd. (39 sets), and the National Gas & Oil Engine Co., Ltd. (82 sets). All the electrical equipment for these sets will be made by Brush Electrical Engineering Co., Ltd. Originally thirty-seven companies from all over the world tendered for this contract.

Steam Power in Ontario

The Hydro-Electric Power Commission of Ontario, which since the war has constructed two large steam power stations—both equipped with British plant—to supplement its extensive hydro-electric developments, has now announced plans for two new stations, each larger than any similar plants in the world. If present negotiations are successful, preliminary construction work will start before the end of this year and both stations will be completed by 1968. The total cost will be in the region of $500 million (£190 million).

Negotiations are under way for two sites, one on the western side of Toronto and the other at Hamilton. Each station will have six 300 MW turbo-alternators, making the combined capacity 3,600 MW. We understand that tenders have already been called for two units.

Lighting in New Jarrow Factory

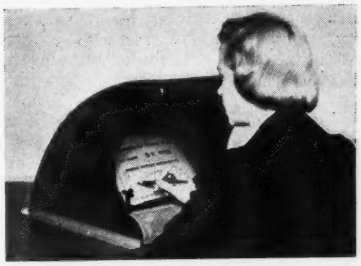
In the main building at the new factory of Morganite Resistors, Ltd., Bede Trading Estate, Jarrow, over 1,200ft of Mazda universal trunking has been installed in nine 135ft runs parallel with the north-light bays at a height of 15ft above floor level. More than 100 fluorescent twin-lamp 5ft reflectors with upward lighting slots are attached directly to the trunking which also houses all the necessary control gear. Reflectors are spaced on the trunking at approximately 10ft intervals but may be rapidly respaced with or without the addition of extra reflectors to give any changes in illumination level to suit production requirements. The trunking also carries ancillary services such as G.P.O. internal telephones and machine cabling. Smaller rooms in the factory have lighting fittings suspended from either Mazda "Invertrunking" or shallow trunking.

Mazda universal trunking in the new factory of Morganite Resistors, Ltd., Jarrow

The building itself was constructed for North East Trading Estates, Ltd., of Newcastle, and the suspended ceilings for the Mazda "Invertrunking" were installed by Draftsele, Ltd. The architects were Turley & Williamson, Newcastle, and the electrical contractors, the Bonham Electrical Co., of North Shields.

Picture Transmission System

A new picture transmission system, known as "Deccafax" has been introduced by Decca Radar, Ltd. This low cost system transmits television style pictures and sound between points interconnected with coaxial cable at distances of up to 2,000 yd. Based on television receiver principles,



"Deccafax" master unit which can be used either as a transmitter or receiver

the master unit can relay both sound and picture to modified standard television receiving sets for one-way announcements, etc., or the other master units for two-way speech/vision intercommunication.

The system is versatile in that transmitted pictures or messages can take many different forms, ranging from complete 35 mm cine-films to simple transparencies of a diagram or pro forma. By employing standard television sets as receivers the company have ensured a multiplicity of uses for the system. As an example, announcements could be routed from a single master unit to all or any of a number of television receivers at an airport terminal, these receivers being also used to receive the normal television programmes for entertainment purposes. Another application meets the requirements of information collation and filtering at centres where complicated visual displays are necessary, such as at air traffic control centres and defence operations rooms. A number of remote master units can be interconnected to feed different types of information to a central receiver for enlargement on to a viewing screen. Control can be exercised over the

various inputs so that the main display shows only the specific information necessary at any one time.

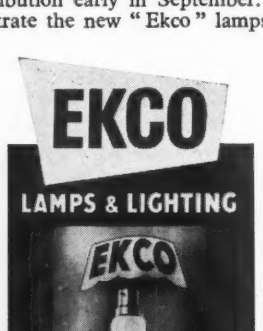
The system has many other uses. For instance photographic negatives can be reversed and displayed as positives, several pictures can be superimposed on to a single viewing screen and private film shows can be given without using a cinema and without having the noise of a portable projector in the room.

New Zealand Import Licensing

Particulars are given in the *Board of Trade Journal* of 23rd August of the New Zealand Government's import licensing arrangements for 1958. The lists reproduced show the classification of goods (including many electrical items) into those exempt from licence requirements and those which fall into various other categories.

Lamp Publicity

Ekco-Ensign, Ltd., has prepared a variety of attractive publicity material for the forthcoming lighting season. The company is embarking on an ambitious publicity scheme which will include advertisements in periodicals and the trade and technical Press. Already a wide distribution has been made of the new "Ekco" lighting catalogue and this publication is still available. In addition, an extensive range of catalogues, brochures, leaflets and sales aids have been prepared for distribution early in September. We illustrate the new "Ekco" lamps and



A new "Ekco" lamp showcard

lighting counter showcard which combines a "mobile," in the form of a lamp and canopy suspended on nylon thread, which revolves in the air currents.

Large Turbo-Blower for Canada

The British Thomson-Houston Co., Ltd., has received a contract valued at nearly £100,000 for the largest blast furnace turbo-blower supplied by the company for installation overseas. The order, which also includes condensing plant, is for the Algoma Steel Corporation of Canada and was received through the British Thomson-Houston Co. (Canada), Ltd., of Toronto.

The plant is normally rated at 85,000 cu ft/min, 30 p.s.i.g., but will be capable of dealing with the maximum volume of 100,000 cu ft/min at a discharge pressure of 20 p.s.i.g. The machine, which will be made in the B.T.H. Rugby Works, will be equipped with the most modern form of volume regulation and anti-surging controls.

Telephone Equipment for Pakistan

An order has been placed with the Automatic Telephone & Electric Co., Ltd., for two 3-channel carrier telephone systems being provided for training purposes in Pakistan under the Colombo Technical Aid Plan, sponsored by the Commonwealth Relations Office. Three-channel systems of this sort are particularly suitable in territories where growing telephone demands make it necessary to increase the traffic carrying capacity of existing open-wire systems with the minimum expenditure.

Drying Plant for Nuclear Stations

Orders have been received by the Dryer Division of Birlec, Ltd., for drying plant for three of the nuclear power stations in Britain. The application will be the same in all three stations, namely the extraction of water vapour from the carbon dioxide gas employed in the transfer of heat from the nuclear reactor to the heat exchanger. Further atomic energy contracts recently placed with the company's Dryer Division include two for drying plant for the United Kingdom Atomic Energy Authority's establishments at Harwell and Aldermaston. In both instances the dryers are to be used in connection with Van de Graaf generators.

Batteries for Greek Power Station

For the new St. George's Bay power station built in Greece for the Athens Piraeus Electricity Co., Ltd., Nife Batteries of Redditch, Worcs., have supplied to the English Electric Co., Ltd., six large storage batteries for switchgear operation and emergency lighting.

Largest of the six has a capacity of 440 Ah and consists of 184 "Nife" low resistance cells. In the event of a mains failure it will supply an emergency lighting load of 3 kW for 30 minutes. It will also be required to supply oil motor pumps of 29 h.p. and disc feeder motors of 6 h.p. for a period of 30 minutes. The switchgear duties of this battery include operating three 66 kV circuit-breaker closing solenoids, each of 27 kW; thirty-eight 3·3 kV circuit-breaker closing solenoids, each of 10·7 kW; eleven 415 V circuit-breaker closing

This new display stand, made from one piece of board for Falks "Globe-Trotter" universal travel iron, is screen printed in four colours. The positioning of the iron locks the display, which measures 9½in high, 8in wide

solenoids, each of 10·7 kW; and ninety-three 415 V contactor closing coils, each of 0·084 kW.

Of the other five batteries, all of which are 110 V units of 92 low resistance cells, two are 95 Ah capacity batteries, and three 60 Ah batteries. The batteries are all used for switchgear operation, the larger size meeting a load of 200 A each for 50 operations and the smaller supplying current for 50 operations of 136 A each.

British Trade Fair, Helsinki

Electrical exhibits at the British Trade Fair to be held at Helsinki, Finland, from 6th to 22nd September cover a wide range that extends from appropriate indications of the progress being made in the construction of nuclear power stations for the Central Electricity Authority down to representative examples of the enormous variety of small domestic appliances made in Great Britain. In between come numerous items relating to industrial electrical apparatus that give a similar idea of what is available for export in the field of heavy and medium electrical engineering.

S.I.M.A. Annual Convention

The Scientific Instrument Manufacturers' Association is holding its sixth annual convention at Eastbourne from 24th to 27th October. Entitled "Enterprise 1958," the event is mainly concerned with the commercial side of the industry and will consider the meeting of the challenges of the future, especially that of the European free trade area. The Marquess of Exeter (formerly Lord Burghley), chairman of Cossor, Ltd., will be the opening speaker.

The four separate discussion panels of the Convention will be "European

Free Trade—a Challenge," "Presentation and Publicity," "Methods and Materials for To-morrow," and "Nucleonics."

Fluorescent Tube Guarantee

The General Electric Co., Ltd., is offering a special guarantee to users of "Osram" standard straight fluorescent tubes in the 1½ft to 8ft range. Free replacements will be given if any new tubes fail before 3,000 hours or one year of use—whichever is the shorter. This guarantee, the company says, is made possible by stringent control of materials and manufacture, combined with rigorous life tests on batches of newly produced tubes.

"Wireless World" Special Issues

Details of this year's Radio Show will be fully reported in two special issues of *Wireless World*. The September issue now on sale is a complete stand-by-stand guide—a most valuable aid to planned and easy viewing of all exhibits. The October issue will consist of an authoritative survey of every technical development introduced at the Show.

E.C.A. Conference, 1958

Next year's annual conference of the Electrical Contractors' Association is to be held at Folkestone from Sunday 18th May to Tuesday 20th May.

Wholesalers' New Premises

New showrooms have been opened at Blandford Street, Newcastle-on-Tyne, by the Bryterlite Electrical Co. (Glasgow), Ltd., electrical wholesalers. The new premises are three storeys high and cover a site of 5,000 sq ft. The opening ceremony was performed by Mr. B. Wober, vice-director.

The Newcastle showrooms are the first branch premises of the company in the North-East of England, and the sixth distribution depot in the United Kingdom. The company deals in all types of electrical, radio, and television equipment, including Continental fittings. The manager of the showrooms is Mr. Frank Clark.

Permali Magazine

The house magazine published by Permali, Ltd., has been revived under the title "Permali Group News." It includes illustrated notes on the use of the company's equipment in high voltage test establishments, progress in "Permaglass," etc.

Evening Classes in London

We have received from the London County Council their annual publication "Floodlight," a guide to evening classes available at the institutions under the Council's jurisdiction during the coming season. The main body of this 94-page publication is an alphabetical list of subjects (including many electrical), showing a remarkably wide and varied range and indicating the institutions catering for each. This is followed by a list of the names, addresses and telephone numbers of the institutions, particulars of fees (which are very low) and a note on library services. "Floodlight" is obtainable from booksellers and newsagents or directly from the L.C.C. at County Hall, London, S.E.1, at 6d.

Enrolment for the classes begins on 16th September and the classes start on 23rd September.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton	£197 0s 0d
COPPER, H.C. Electro	ton	£203 0s 0d
Fire Refined 99·70%	ton	£202 0s 0d
Fire Refined 99·50%	ton	£201 0s 0d
COPPER Tubes ..	lb	1s 11¾d
Sheet	ton	£229 10s 0d
H.C. wire and strip ..	ton	£257 5s 0d
LEAD, English ..	ton	£90 15s 0d
Foreign	ton	£89 0s 0d
MERCURY	flask	£87 0s 0d
TIN, block (English) ..	ton	£737 10s 0d
ZINC, G.O.B. Foreign	ton	£73 5s 0d
Electrolytic	ton	—
BRASS Tubes (solid drawn)	lb	1s 7¾d
Sheet	ton	—
Wire	lb	2s 4¼d
PHOSPHOR BRONZE Wire	lb	3s 8¾d
PLATINUM	oz	£31 0s 0d
RUBBER, No. 1 R.S.S. spot	lb	26d—26¾d

Cumberland Television Station

A permanent television transmitter being built by the B.B.C. at Sandale (Cumberland) is expected to come into operation in December. The mast is 500ft high compared with the present temporary 100ft mast, and will serve an area with a population of about 400,000.

Economy in Building

At a Press conference in London last week some particulars were given of the operations of C.A.S. (Industrial Developments), Ltd., who claim to reduce the cost of building developments by up to 11 per cent. This saving is achieved by the organisation of a "team" consisting of consultants, contractors and sub-contractors who are retained on a permanent basis and are given their work on negotiated prices. There is no competitive tendering but a severe check is maintained on sub-contractors' prices. Regular "integration" meetings of the team are held at which copies of plans for the next two years are circulated. Among projects which have recently been carried out by the Group is a factory for Permali, Ltd., at Gloucester. This was to have been carried out in nineteen months but for certain reasons the company wanted the work completed three months earlier and by the co-operation of those in the group this was achieved.

Epoxide Resin Tools

The latest information to be published by Bakelite, Ltd., describes four methods of manufacturing epoxide resin tools. These methods embrace small and lightly stressed tools of intricate contour, e.g. pantograph models, foundry patterns, etc., large lightly stressed tools of non-intricate contour such as checking and assembly fixtures; and highly stressed tools, particularly press tools for metal forming. The information sheet sets out in considerable detail all the relevant information on epoxide tools, including the materials required, the preparation of materials and moulds, and data on cured epoxide resin based castings and laminates. It also lists suppliers of ancillary materials and equipment.

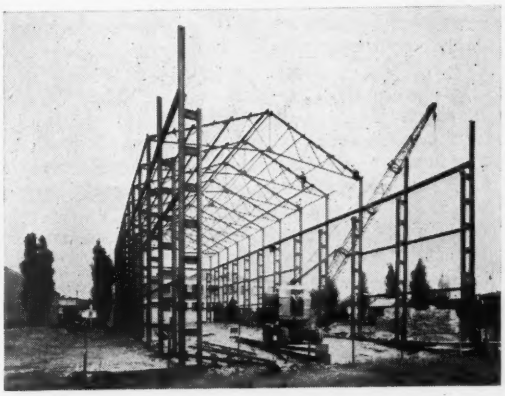
Birmingham Electric Club

The opening meeting of the Birmingham Electric Club will be held at the Grand Hotel, Birmingham, on 16th September, when the new president, Mr. J. Clement, will deliver his presidential address. The annual dinner of the Club will be held on 18th October, also at the Grand Hotel, Birmingham. Applications for tickets (£3 3s) should be made by 27th September to Mr. J. R. Anderson, hon. social secretary, 76, Somerville Road, Sutton Coldfield.

Transformer Works Extension

During the past two years the production capacity of Gresham Transformers, Ltd., has been expanding to meet increased demand. The latest extension to the company's works has been planned to enable transformers of greater physical dimensions to be produced. The accompanying photograph shows the steelwork framing of

New extension to the Hanworth factory of Gresham Transformers, Ltd.



the new building at Hanworth which will also support the overhead travelling cranes.

Hampstead Tube Jubilee

Half a century ago the Charing Cross, Euston and Hampstead Railway (the "Hampstead Tube") was opened by Mr. Lloyd George, the then President of the Board of Trade. It was eight miles long and was looked upon as the completion of the expansion of the London Underground Railway; it now forms part of the Northern Line which extends as far as Edgware.

To mark the jubilee the London Transport Executive has published a brochure "Fifty Years of the Hampstead Tube," by Charles E. Lee (2s). In this a detailed history is given, with illustrations, of the line and its role in the Underground system.

Trade Announcements

The A.E.I. Lamp & Lighting Co., Ltd., announces that from 2nd September the new address of its Bristol area office and stores will be 1-3, Trinity Street, Bristol, 2 (telephone: Bristol 51494/6). The address of the Exeter area office and stores remains at Mary Arches Street, Exeter (telephone: Exeter 55749), and that of the area stores at Plymouth, Chapel Street, Regent Street, Plymouth (telephone: Plymouth 61915).

Due to changes in the names of Edinburgh telephone exchanges, the numbers of the Edinburgh branch office of **British Insulated Callender's Cables, Ltd.,** from 31st August will be Caledonian 6786/7/8.

Mr. A. Hamer has been appointed Control Gear Division representative of **G.W.B. Furnaces, Ltd.,** for the area comprising Lancashire, Cheshire and North Wales. His present address is 59, Park Road, Hale, Ches.

Mr. L. H. Brooke has been appointed lighting representative for **Philips Electrical, Ltd.,** in the North Staffordshire area. He will be based upon the company's depot at Hanley, Stoke-on-Trent.

The London office of **Thermotank, Ltd.,** is moving, with effect from 2nd September, to larger premises at Marine Engineers' Memorial Building, 18, London Street, London, E.C.3 (telephone, Royal 7343-4). The telephone number of the offices and works of the Thermotank Group at West Drayton, Middlesex, is to be changed on 2nd September to West Drayton 3685-9.

The Instrumentation Division of **Costain-John Brown, Ltd.,** has opened a branch office at Jaffrey's Chambers, 63, Brown Street, Manchester, 2 (telephone, Blackfriars 5575), under the management of Mr. W. Brown, the company's area instrument engineer.

The factory, trade counter and stores of **Morley's Electrical Services (Holloway), Ltd.,** have been moved to larger premises at Lowman Road, London, N.7.

Change of Name

The Hanwell Engineering Co., Ltd., Northampton, has been taken over by Pollard Bearings, Ltd., and the title of the company is now changed to Pollard Bearings (Northampton), Ltd. The telephone number remains as at present, Northampton 3766/7/8.

Overhead Traction Supplies

PORTAL STRUCTURES FOR 25 kV A.C. EQUIPMENT

IN the past, in this country, overhead electrification has generally been carried out at 1,500 V d.c., and heavy steel supports were necessary to carry the large-section wires and their associated equipment. Now that 25 kV a.c. electrification has been adopted by the British Transport Commission, smaller wires can be used, but in order to ensure good current collection at all times they must be kept at constant tension, by means of balance weights, throughout most of the temperature range. As the temperature varies the wires move along the track, thus applying a torque to the bridge of any portal structure used to support them.

To meet these new loading conditions careful consideration had to be given to the design of a supporting structure combining such desirable features as lightness, economy in manufacture, avoidance of obstruction to the sighting of signals, and good appearance. A new type of portal structure to fulfil these needs has now been designed and developed by the Traction Department of British Insulated Callender's Construction Co., Ltd., to the requirements of the chief electrical engineer and the chief civil engineer, British Railways. It is constructed with angles as the main members and rod bracing welded to the toes of the angles. After fabrication the complete structure is galvanised.

Recently a prototype structure was constructed and tested at Painter Bros.' Works, Hereford. It is designed for use over five tracks, has a span of 71ft, weighs 1¼ tons, and is fabricated from 2in by 2in by $\frac{5}{16}$in angles with $\frac{5}{8}$in diameter rods jig-welded to the angles. The heavy type of structure previously used for 1,500 V d.c. equipment with the same span would have weighed about 2½ tons. At the tests, loads typical of those that would be caused by the equipment and by wind were applied to the structure. There was no undue deflection and no permanent "set" when loads of 1½ times the maximum working figure were applied, and there was no failure when these were increased further to 2¼ times the working loads. This welded rod type of structure will be a standard type for use when three, four or five tracks are spanned and it will be employed in large numbers in the extensive main line electrification at 25 kV 50 c/s for British Railways.

Welded-steel portal structure for British Railways 25 kV a.c. system electrification

Electrical Equipment Failures

EXAMPLES FROM AN INSURANCE COMPANY'S TECHNICAL REPORT

ACCOUNTS of a number of investigations of failures of mechanical and electrical equipment are contained in Volume III of a new series of technical reports of the British Engine Boiler & Electrical Insurance Co., Ltd., 24, Fennel Street, Manchester, 4 (price 15s). The following notes relate to a selection of the more directly electrical failures and investigations.

The motor concerned in the failure of a squirrel cage

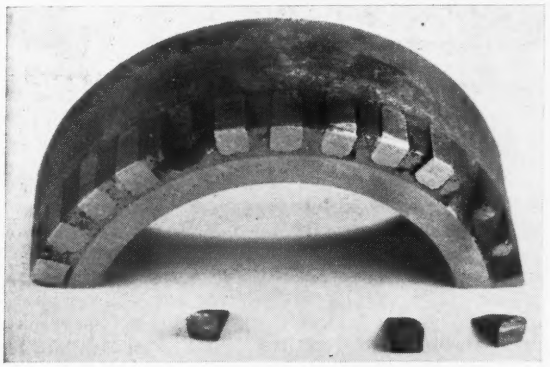


Fig. 1.—End ring of s.c. rotor with ends of bars sawn close to ring

rotor owing to defective brazing formed part of a submersible deep-well pump unit. Following a decrease in the pump output, which was associated with a drop in the motor current, the unit was raised and subsequent examination of the motor revealed that several of the rotor bars had become loose where they had been brazed into the lower end ring. No obvious evidence of overheating in the vicinity of the affected part was present, but there was a thin coating of hard, light grey deposit on the upper portion of the rotor core suggestive of calcareous scale deposit from the well water in which the motor was immersed. The affected end ring was removed by sawing through the bars close to it, and one half was submitted for examination for the purpose of ascertaining whether the brazing had been initially defective or if deterioration had taken place in service.

The appearance of the ring in the condition in which it was received is shown in Fig. 1, the saw-cut through the bars having been dressed on abrasive paper before photographing. In the course of this dressing operation the ends of several of the bars fell out, these being depicted in the foreground, while the majority of the remainder were found to be loose. The method of assembly of the rotor cage, which was of copper throughout, was as follows: the ends of the bars were machined to a taper of approximately 60 deg, the end rings being chamfered to correspond. The bars were inserted in the rotor slots, the rings then placed in position and the brazing metal run in, this serving not only to attach the bars to the rings but also to fill in the intervening spaces between them. It will be noted from the illustration that the brazing metal filling the spaces was very porous.

It was evident that the primary cause of failure was a defective union between the brazing metal and the ends of the bars, adhesion to the ring itself being good. Apparently the electrical conductivity of the joints between the rings and the bars was sufficiently good originally to allow the motor to pass its production acceptance tests and to perform satisfactorily when first installed, but the adhesion evidently deteriorated progressively in service, probably as a result of slight movements of the bars gradually breaking the intact portions of the joints, resulting, of course, in an increase in electrical resistance and a consequent falling-off in performance.

Cavities in a Conductor

Under the heading "Some Manufacturing Defects in Copper Conductors" is the case of the fusing of one of the copper leads in the choke circuit of an electric welder. A piece of the affected lead was obtained for examination, as the immediate cause was obscure. The sample was about 7½in long, the major part of it being illustrated in Fig. 2 which shows the end that had fused in service and also some of the metal that had melted and run over the outer surface. In the course of subsequent handling the sample fractured about 2½in from the fused end, revealing the presence of a large internal cavity. The surface also showed a number of small bulges, some of which are depicted in the illustration. The diameter of the sample was not uniform. At the end remote from the point of fusion and for a distance of about 3in therefrom it measured 0·210in, decreasing to between 0·183in and 0·170in over the next 2in, then increasing to 0·208in for an inch or so and finally decreasing to 0·185in over the remainder. Longitudinal sectioning of the sample disclosed several cavities similar to the one at which the sample had broken, these being shown in Fig. 3. The

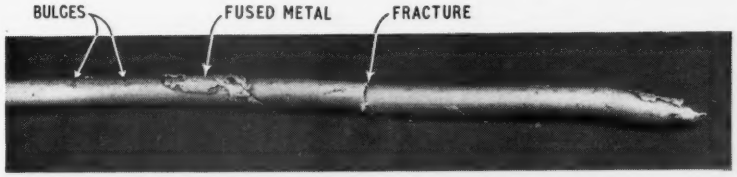


Fig. 2.—The end of the copper lead in the choke circuit of an electric welder has fused in service

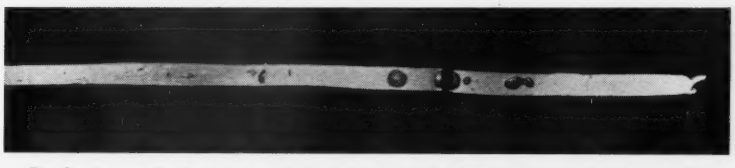


Fig. 3.—Longitudinal sectioning of the welder choke lead disclosed several cavities similar to the one at which the lead had broken

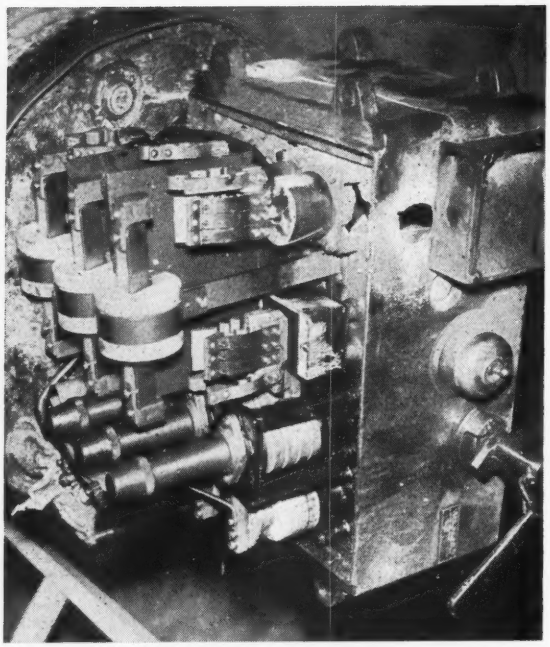


Fig. 4.—Damaged circuit-breaker of 200 h.p. motor group driving carding machines; note 15 A tumbler switch on circuit-breaker for controlling no-volt circuit

surfaces of the cavities were, in general, bright and smooth, although they showed some irregularity in places. The larger cavities tended to take the spherical form, and when two of the bulges were filed away spherical cavities were disclosed beneath them.

Failure in service was due to overheating resulting from the inability of the conductor to carry the current where its cross-section was reduced by the presence of a cavity. In the case of the largest of the cavities the annulus of remaining metal was only 0·03in in thickness and the external diameter 0·210in, which gives a cross-sectional area of 0·0169 sq in, this being equivalent to an effective reduction of approximately 50 per cent as compared with that of the sound material. The actual reduction in area was not, therefore, as severe as the magnitude of the cavity would suggest. The bulges, which were associated with cavities below the surface, doubtless formed during final annealing of the wire or even, perhaps, as a consequence of a temperature rise in service, the heat causing gas within the cavities to expand and develop sufficient pressure to bring about distension of the cavities at those points where the remaining metal was of insufficient thickness to withstand the stress without deforming.

Defective Servo Motor Wiring

A failure that might have had more disastrous consequences occurred at the instant of switching off a circuit breaker controlling a 200 h.p. s.r. motor driving the line shaft serving a group of carding machines in a cotton mill. This circuit-breaker, which had been in service for approximately 30 years, was situated in the switch-room, being part of the main switchboard, and supplied the stator circuit of the motor.

The circuit-breaker was of the iron-clad, oil-immersed unit type, with an interlocked isolating chamber situated directly above the oil switch proper. With the switch lowered, the tongs of the oil switch section disengaged from the jaw connections of the isolating chamber, so isolating the circuit-breaker from the busbar chamber. The liquid starter for the rotor circuit was situated in the motor-room and was automatically wound in and out by a fractional h.p. servo motor.

At the time of the failure the motor had been driving the shafting for evening shift work and had been running continuously since 7.30 a.m. the same day. The sequence of events leading to the failure was as follows:—

At the end of the evening shift the operator went to the circuit-breaker in order to stop the line-shaft motor in the normal manner by switching off the 15 A tumbler switch used to break the no-volt circuit. This tumbler switch was mounted on the front of the circuit-breaker itself, as shown in Fig. 4. During the action of operating the tumbler switch the operator fortunately moved sideways to stop the next motor, and before he reached the front of the adjacent circuit-breaker an explosion occurred inside the breaker which he had just tripped. All the lights were extinguished, flames issued from the circuit-breaker and some large cardboard cases situated approximately 12ft away were set on fire.

From the nature of the damage it was concluded that the failure originated from a defect in the servo motor wiring where it ran round the inside of the top part of the circuit-breaker above the oil compartment. The wiring had burnt away and its failure whilst carrying a current would cause arcing and ionise locally the gaseous contents of the compartment, and it was this that probably led to an electrical breakdown between the nearby main isolator pillars, causing the flashover that occurred across all three phases and to earth. Two holes were also burnt in the casing, one through the front and another through the base into the oil tank, the latter causing the fire within the tank. In addition, the incoming isolator connections were burnt off level with the metal platform plate of the circuit-breaker and the insulators completely fused.

"Deuce" Computer Installations

FIVE "Deuce" computers will be in Government service by next spring. The latest order for a machine has been placed with the English Electric Co., Ltd., by the Mechanical Engineering Research Laboratories of the Department of Scientific and Industrial Research at East Kilbride, Scotland. The D.S.I.R. already has a "Deuce" computer at the National Physical Laboratory, Teddington; two are installed at the Royal Aircraft Establishment, Farnborough, and one at the Atomic Weapons Establishment, Aldermaston.

Recent installations have meant that the "Deuce" now has the largest installed capacity in Europe for computers of comparable size, and that more models of this machine are operating than of any other general purpose computer. In addition to thirteen operational machines in England, a fourteenth has been working at the New South Wales College of Technology in Australia since last September.

The computer for East Kilbride will be employed mainly in calculations in hydro- and thermo-mechanical problems. It will be the first machine of the series to be equipped with high-speed paper tape as well as punched card input. This will increase the flexibility of its applications, one of which will be to process paper tape data from the East Kilbride water tunnel.

Three "Deuce" computers installed at English Electric centres in Stafford and London are used on a time hire basis and are heavily committed to programmes of research, design and development in electrical and mechanical engineering, aerodynamics, nuclear power and statistics. A further two machines are in full-time use on an extensive programme of development of ancillary equipment.

OVERSEAS ELECTRICAL TRADE

RECORD VALUE OF EXPORTS IN JULY

A LARGE shipment of submarine cable—presumably for the Pacific telephone link between California and Hawaii—was mainly responsible for the fact that British electrical exports in July reached the highest value yet recorded in any month. The total of £21,670,000 exceeded the June figure by over £2 million and that for July last year by more than £3 million.

Submarine cable exports amounted to £1,774,726, making the total for the first seven months of the year £4,074,385 against £1,442,127 for the corresponding period of 1956. This accounts for the greater part of the increase in cable exports as a whole, from £21,293,200 in the first seven months of 1956 to £24,276,344 this year. A quarter of the latter total (£6,006,271) went to the United States, compared with £2,343,858 in January-July, 1956. The £2 million worth of wires and cables purchased last month made the United States, probably for the first time, Britain's leading customer for electrical

TABLE I.—ELECTRICAL EXPORTS

Class	Month ended 31st July, 1957	Seven months ended 31st July, 1956	Seven months ended 31st July, 1957
	£	£	£
Generating sets and generators:			
Diesel-driven, up to 10 kW	145,633	1,050,823	1,051,518
Ditto, 10 to 65 kW	206,237	887,729	1,165,281
Ditto, 65 to 200 kW	105,745	1,021,928	883,438
Ditto, over 200 kW	141,261	2,094,906	2,223,036
Spark ignition engine driven	17,492	246,945	123,025
Steam turbine driven	26,083	471,031	289,514
Hydraulic turbine driven	—	51,786	—
Other prime mover driven	11,370	441,476	189,878
Generators, not exceeding 200 kW	185,266	885,077	1,119,687
Ditto, over 200 kW	187,721	568,820	951,862
Parts of generators	313,266	3,894,583	2,588,226
Motors, complete, other than railway, tramway and trolley-bus:			
Up to ½ h.p.	207,864	1,391,247	1,420,374
Over ½ but under 1 h.p.	52,887	422,630	331,024
1 h.p. to 250 h.p.	506,427	2,953,554	3,426,338
Over 250 h.p.	265,803	508,733	976,867
Railway, tramway and trolley-bus motors complete and parts of all motors	209,363	1,155,584	1,439,947
Motor starting and controlling gear	350,949	1,681,183	2,250,952
	2,933,367	19,728,035	20,430,967
Converting machinery	31,368	241,150	401,564
Mercury-arc rectifiers	147,675	474,779	747,936
Transformers for lighting, heating and power (incl. coils):			
Not exceeding 7,500 kVA	547,258	7,492,604	4,423,727
Over 7,500 kVA	485,738		1,799,905
Switchgear and switchboards (not telegraph or telephone), up to 200 A and 660 V	439,760	1,933,824	2,400,180
Ditto, other	1,332,923	8,301,220	8,448,271
	2,984,722	18,443,577	18,221,583
Primary batteries:			
Lighting	93,863	559,789	689,280
Radio	181,254	1,745,959	1,787,060
Other	55,168	304,684	301,961
Parts (excl. carbons)	68,154	271,147	393,276
Lamps:			
Filament, exceeding 28 V*	101,608	719,125	654,766
Ditto, under 28 V*	30,144	214,382	214,767
Arc lamps and searchlights	14,089	150,203	99,353
Discharge lamps, fluorescent tubes, etc.	105,073	487,731	659,907
Radio and television, etc., apparatus:			
Thyratrons, hot cathode mercury vapour and gas-filled rectifiers (excl. mercury arc rectifiers), photo-electric cells, stabilising and cold cathode valves, magnetrons, klystrons	29,848	188,482	168,430
All other	341,766	1,681,411	2,123,062
Parts (excluding glass bulbs)	14,125	76,946	85,272
Radio and television transmitters	54,623	691,426	466,116
Commercial radio and radar equipment	1,538,447	8,546,359	9,000,969
Domestic radio receivers, mains	123,869	959,306	800,412
Ditto, battery	42,859	557,789	395,723
Ditto, other (incl. car)	18,845	178,511	184,699
Radiograms	34,609	250,311	201,694
Television sets	47,956	277,591	413,302
Public address equipment	94,403	618,061	665,638
Other radio and television apparatus, n.e.s.	26,872	231,189	305,888
Components and parts, n.e.s.	833,419	4,779,134	5,629,383
	3,201,641	19,036,516	20,440,588
Telegraph and telephone installations	869,749	4,374,576	5,075,259
Telephone instruments, separately consigned	165,619	937,904	1,140,565
Telegraph and telephone parts	791,423	4,408,956	5,703,777
Line apparatus for long distance commun.	303,206	1,456,621	1,274,608
	2,129,997	11,178,057	13,194,209

Class	Month ended 31st July, 1957	Seven months ended 31st July, 1956	Seven months ended 31st July, 1957
	£	£	£
Cookers	57,281	581,007	461,111
Toasters	27,993	164,530	140,654
Other cooking apparatus	33,551	256,599	221,570
Parts and accessories	49,231	592,505	475,522
Space heating appliances	28,331	265,809	231,374
Water heating appliances	33,168	236,411	227,700
Other heating appliances	28,747	282,772	259,867
Parts and accessories	56,766	444,986	401,810
Irons	97,631	684,798	508,887
Arc welding equipment, a.c.	46,422	397,460	374,514
Ditto, d.c.	36,522	320,523	321,402
Resistance welding equipment	34,586	135,604	172,391
Electric furnace plant	59,104	408,947	616,651
Magnetos, ignition	11,431	230,335	187,223
Sparking plugs	210,766	1,111,071	1,177,364
Elec. appliances for aeroplanes, n.e.s.	303,480	1,512,773	1,913,184
Ditto, for motor vehicles, n.e.s.	318,655	2,505,515	2,503,744
Ditto, for cycles, n.e.s.	62,754	476,532	416,956
Signalling app. (incl. traffic signals)	101,620	436,131	815,840
Instruments, commercial	151,706	1,229,919	1,239,603
House service meters (including parts)	112,119	1,159,677	999,588
Electro-medical apparatus (not X-ray)	46,663	241,229	296,192
X-ray apparatus (excl. tubes and valves)	90,565	455,995	511,197
Vacuum tubes	35,983	198,240	308,658
Ceiling fans, complete	80,848	760,899	854,742
Desk fans, complete and parts of desk and ceiling fans	41,837	248,237	275,136
Vacuum cleaners	160,239	984,167	1,068,023
Floor polishers	107,675	543,400	615,543
Food mixers	75,101	455,961	348,812
Hair clippers and dry shavers	62,309	481,190	559,890
Other portable appliances	29,849	219,328	198,081
Parts	121,865	828,052	933,910
Portable elec. tools (not saws) and parts	221,012	1,519,161	1,557,051
Cables and wires:			
Telegraph and telephone, submarine	1,774,726	1,442,127	4,074,385
Ditto, other	1,043,249	5,879,638	6,927,416
Cotton, silk or art. silk insulated	39,489	401,239	270,452
Enamel, glass or asbestos insulated	78,174	668,293	680,961
Paper insulated	656,772	6,647,966	5,694,731
Rubber insulated	537,088	3,656,788	3,940,391
Thermoplastic insulated	242,201	980,475	1,372,255
Other	193,246	1,616,674	1,315,753
	4,564,945	21,293,200	24,276,344
Accumulators for motor vehicles	174,246	1,214,432	1,085,351
Ditto, traction	13,444	157,367	183,523
Ditto, radio and other portable	49,393	614,779	532,626
Ditto, other	38,606	472,975	225,792
Parts and accessories	71,864	612,074	583,459
Elec. porcelain, etc. (incl. insulators), n.e.s.	79,890	795,664	758,718
Insulating cloth and tape	57,074	421,857	418,649
Other insulating material	112,153	736,788	682,787
Permanent magnets	83,939	317,709	359,256
Radio, telegraph and telephone testing equipment, n.e.s.	64,761	304,597	466,669
Scientific electrical instruments (not telegraphic or telephonic):			
Time recorders and time switches, complete	14,512	96,833	84,139
Other	307,761	1,412,122	2,084,495
Electrical machinery, n.e.s.	104,965	831,390	550,926
Electrical apparatus and appliances, n.e.s.	1,100,724	5,513,530	6,503,562
TOTAL	21,673,167	128,004,275	137,078,203

* The figures for 1957 are not completely comparable with those for previous years.

TABLE II.—DISTRIBUTION OF EXPORTS OF ELECTRICAL MACHINERY, APPARATUS AND APPLIANCES

Country	July, 1957	Seven months ended July, 1956	Seven months ended July, 1957	Country	July, 1957	Seven months ended July, 1956	Seven months ended July, 1957
	£	£	£		£	£	£
Channel Islands	92,560	504,373	624,299	Western Germany	228,366	1,228,316	1,402,381
Gibraltar	18,167	267,795	129,982	Netherlands	751,244	4,304,987	4,940,824
Malta and Gozo	61,051	423,800	407,933	Belgium	327,440	1,996,554	2,276,565
Cyprus	174,395	996,589	951,139	France	436,256	2,212,387	2,763,152
Sierra Leone	41,829	174,108	253,551	Switzerland	162,875	676,507	894,238
Gold Coast	187,498	975,773	1,294,615	Portugal	174,831	1,137,456	1,760,930
Nigeria	228,852	2,070,194	1,914,113	Spain	329,415	2,661,379	2,551,506
Union of South Africa	1,381,752	9,150,455	10,255,361	Italy	638,499	1,962,793	2,491,724
Rhodesia and Nyasaland	529,455	3,688,264	3,564,487	Austria	25,964	250,126	268,107
Tanganyika	141,858	379,747	502,341	Yugoslavia	59,434	392,603	338,410
Kenya	194,455	1,639,962	1,757,508	Greece	85,965	1,603,508	957,149
Uganda	48,759	520,731	659,693	Turkey	73,404	529,875	400,047
Mauritius	30,412	169,513	225,405	Belgian Congo	40,784	201,908	322,499
Aden	59,396	348,942	339,016	Portuguese East Africa	35,495	148,119	212,093
Bahrain, Qatar and Trucial States	161,670	587,643	1,079,289	Egypt	2,561	1,328,297	16,674
Kuwait	352,691	745,982	2,021,355	Libya	24,396	154,497	248,287
India	1,913,328	12,374,964	14,365,994	Southern Morocco	27,519	298,358	243,137
Pakistan	245,200	2,150,514	1,972,630	Sudan	109,115	571,928	770,241
Singapore	276,994	2,104,438	2,465,606	Syria	8,743	427,877	212,597
Federation of Malaya	233,558	1,869,255	2,022,345	Lebanon	66,010	413,763	273,222
Ceylon	169,340	1,208,035	980,334	Israel	39,071	685,693	458,584
British North Borneo	17,123	178,611	175,057	Jordan	51,921	391,323	439,903
Sarawak	9,170	121,317	172,648	Saudi Arabia	36,628	818,959	369,871
Hong Kong	333,650	1,491,507	1,740,870	Iraq	171,313	2,281,712	1,718,779
Australia	1,718,253	13,384,344	11,805,927	Iran	453,469	1,247,255	2,505,351
New Zealand	1,290,581	6,236,074	6,688,912	Burma	148,061	878,407	618,499
Fiji	12,625	133,943	122,183	Thailand	79,943	703,223	634,223
Canada	1,319,114	7,569,939	7,830,013	Indonesia	54,514	370,651	395,363
Jamaica	115,095	746,670	698,973	Japan	36,535	433,316	552,512
Barbados	11,260	186,276	128,144	United States of America	2,707,211	5,926,114	9,073,456
Trinidad	118,528	778,042	832,603	Cuba	124,603	264,249	382,353
British Guiana	45,214	285,917	281,437	Mexico	218,677	456,938	376,010
Other Commonwealth countries	80,709	606,043	719,727	Colombia	30,851	545,036	415,220
Irish Republic	213,936	2,093,409	1,554,760	Venezuela	375,202	2,000,492	1,994,065
Soviet Union	151,012	1,745,871	1,318,408	Peru	48,118	367,031	417,154
Finland	128,388	1,033,314	981,128	Chile	47,518	200,009	298,287
Sweden	495,064	2,289,959	2,717,152	Brazil	40,576	1,358,774	624,278
Norway	198,920	1,507,663	1,481,603	Uruguay	14,797	79,016	142,835
Iceland	24,853	105,027	123,130	Argentine Republic	203,976	526,367	875,577
Denmark	173,209	1,237,307	1,400,244	Other foreign countries	304,189	1,711,077	2,542,572
Poland	34,591	175,085	339,613				
				TOTAL	21,673,167	128,004,275	137,078,203

equipment with a total of £2,707,211. The success of British manufacturers in the American market is strikingly illustrated by the following figures for the first seven months of the past three years:—1955, £2·7 million; 1956, £5·9 million; and this year, £9·1 million.

Over the seven months' period Britain's best customer, by a substantial margin, has been India. Compared with last year, she has increased her purchases by about £2 million to a total of £14·4 million while Australia (£11·8 million) has taken less than a year ago. Among the smaller markets, there have been noteworthy increases in purchases by the oil producing countries of Kuwait, Bahrain, Qatar and Trucial States.

Exports included in the electrical section of the Board of Trade returns are analysed in Tables I and II. A number of types of electrical and allied equipment are, however, classified under other headings in the returns, so that the industry's total export achievement is, in fact, substantially greater than shown. In some cases electrical manufactures are not separated from other types, e.g. refrigerating machinery; fans, mechanical or electric, other than desk or ceiling; omnibuses and electric trolleybuses; and lifts and escalators. Electrical products for which detailed figures are given include the following:—

Electrically operated washing machines, complete, not exceeding 150 lb net weight: July, £214,138; seven months, £1,992,086 (against £2,088,897). Ditto, 150-250 lb: July, £111,354; seven months, £729,053 (£717,632). Parts: July, £68,004; seven months, £427,277 (£503,042).

Electric locomotives: July, £288,618; seven months, £2,610,193 (£1,337,724).

Locomotives with i.c. engines and electrical transmission: July, £214,458; seven months, £859,409 (£5,681,635).

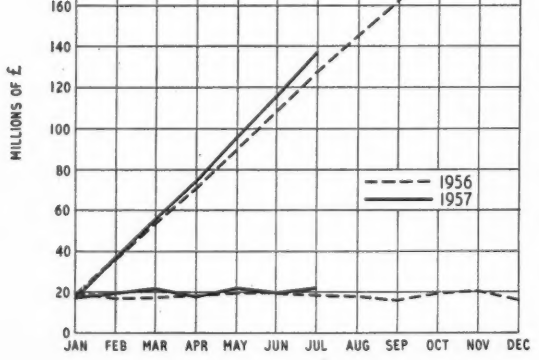
Electric conduit tubes and cased tubes: July, £50,937; seven months, £559,263 (£480,212).

Welding electrodes (excluding carbon), covered: July, £125,632; seven months, £873,522 (£805,098).

Electric carbons, including parts: July, £57,661; seven months, £402,898 (£344,444).

Electric lighting fittings and lanterns, complete, with or without bulbs (excluding arc lamps, searchlights and cycle lamps): July, £200,263; seven months, £1,450,185 (£1,019,028).

Other electric lighting appliances (excluding vacuum tubes and lamp bulbs) and fittings and parts n.e.s.: July, £212,568; seven months, £1,683,638 (£2,318,177).



Electrical Imports

Imports of electrical goods and machinery last month amounted in value to £2,355,986 against £1,894,693 in June and £1,820,108 in July, 1956. For the first seven months of the year the aggregate value was £15,080,172 (against £13,806,168). The three leading suppliers last month were again the United States, Western Germany and the Netherlands, their respective figures being £566,242, £456,311 and £434,203.

Electrical Work in Building Contracts

Operation of the Fair Trading Policy

By ARTHUR S. LOWE*

THE Schedules of the Electrical Fair Trading Policy have always had regard to the fact that architects and consulting engineers frequently seek quotations for, and order, electrical products on behalf of their clients. The Schedules provide that where the client's name is revealed and he is entitled to discount under the Policy, he may be quoted or charged the appropriate terms through the architect or consulting engineer; otherwise list prices should be quoted.

Judged by the queries which arise from time to time in this connection, however, it is clear that it is necessary to amplify this guidance where, as often is the case, a Schedule of Conditions of Building Contract issued under the sanction of the Royal Institute of British Architects, the National Federation of Building Trades Employers and the Royal Institution of Chartered Surveyors is involved (referred to hereinafter as the "R.I.B.A. Contract").

R.I.B.A. Contract

This Contract has been devised and accepted as standard in the building industry. It establishes the terms of contract between the building owner and the main contractor (i.e. the building contractor), based on the customs and practices of the building industry and is not binding on the electrical industry. The terminology of this Contract may in itself be confusing and, therefore, a comparison of terms used by the building and electrical industries, respectively, is given below:—

Terms used in the Electrical Industry	Terms used in the R.I.B.A. Contract
Architect's or Consulting Engineer's "CLIENT" (his eligibility for discount depends on compliance with one or other of the Electrical Fair Trading Policy Definitions—if there is no such compliance, list prices only obtain.)	*"EMPLOYER"* (may be a Government Department, a local government authority, a hospital, a nationalised industry, a commercial or industrial undertaking, or a private individual.)
"BUILDER" (his eligibility for discount depends on whether he has an established electrical department in accordance with one or other of the Electrical Fair Trading Policy Definitions—if there is no such compliance, list prices only obtain.)	*"CONTRACTOR"* (the main contractor responsible for the building structure directed by the architect.)
"ELECTRICAL CONTRACTOR" (as defined by the Electrical Fair Trading Policy.)	*"NOMINATED SUB-CONTRACTOR"* (the specialist responsible for a sub-division of the contract — e.g. electrical installation under a separate sub-contract.)
"ELECTRICAL MANUFACTURER" or "ELECTRICAL WHOLESALER" (both as defined by the Electrical Fair Trading Policy.)	*"NOMINATED SUPPLIER"* (the supplier of material or goods, e.g. electrical goods, to be fixed by a "Nominated Sub-Contractor" under a separate sub-contract.)

* Mr. Lowe is Secretary of the Electrical Fair Trading Council.

For the erection of a building governed by the R.I.B.A. Contract, the architect's normal procedure is to adopt one or other of the following methods:—

(*a*) He requests tenders from prospective specialist sub-contractors (including the electrical contractor) for the supply and fixing of goods or for fixing only.

(*b*) He asks for tenders from prospective suppliers for the supply of goods only, leaving the fixing to be done under a separate sub-contract.

The architect then submits details of the various tenders so received to his client (the "employer"), and the successful tenderers become the nominated sub-contractors or the nominated suppliers as the case may be. In the case of the nominated sub-contractors, a builder (the main contractor) is then instructed to enter into the appropriate form of sub-contract with each of them.

An Ambiguous Clause

Principally, the queries on the operation of the R.I.B.A. Contract have centred upon Clause 22, repeated below, which incorporates the "net cost subject to 5 per cent cash discount" principle which is commonly followed in the building industry in respect of that industry's materials:—

Clause 22—Nominated Suppliers

Where prime cost or provisional sums are included in the Bills of Quantities in respect of any materials or goods to be fixed by the contractor:—

(a) Such sums shall be deemed to include 5 per cent cash discount and the term prime cost or the abbreviation P.C. as used in these Conditions shall be understood to mean the net cost to be defrayed as a prime cost or to be defrayed from the said provisional sums as the case may be after deducting any trade or other discount except a cash discount of 5 per cent and shall include the cost of packing and of carriage and delivery. Provided that, where in the opinion of the Architect the Contractor has incurred expense for special packing or special carriage, the Architect shall so inform the Surveyor who shall allow for the same as part of the sums actually paid by the Contractor.

(*b*) All specialists, merchants, tradesmen or others who have been nominated or selected by the Architect to supply such materials or goods, are hereby declared to be suppliers to the contractor and are referred to in these Conditions as "Nominated Suppliers." All payments by the Contractor for such materials or goods shall be in full and shall be paid within 30 days of the end of the month during which delivery is made less only a cash discount of 5 per cent if so paid. Provided that the Contractor shall not be bound to place an order for the supply of materials or goods with a Nominated Supplier who will not agree to allow such 5 per cent discount for cash.

Clause 22 has been responsible for creating the impression that if a manufacturer or wholesaler wishes to qualify as a nominated supplier, the architect is empowered to require them to quote net trade prices irrespective of the discount status (if any) of his client under the Fair Trading

Policy. This is not so, as they cannot be bound by the terms of a contract which is solely between the employer (building owner) and the main contractor (the building contractor). Further, this clause applies only to the supply of goods and materials by nominated suppliers on a prime cost or provisional sum basis *to be fixed by the main contractor* (*viz. the building contractor*).

The payment to the main building contractor, whilst referred to as a 5 per cent cash discount, is in reality a payment to compensate him, *inter alia*, for using his own financial resources in connection with the contract generally. If, therefore, suppliers are asked to quote for electrical products in accordance with Clause 22 of the R.I.B.A. Contract it should be appreciated that the principles of the Fair Trading Policy form the over-riding consideration and prices should be established accordingly.

Electrical Sub-Contractor's Position

Normally, electrical goods and materials are fixed by the electrical sub-contractor, who, in the majority of cases, would be a nominated sub-contractor to whom reference is made in Clause 21 of the R.I.B.A. Contract. No mention is made in Clause 21, however, of the terms which the electrical sub-contractor is to charge for electrical goods and materials for which prime cost or provisional sums are included in the bills of quantities. This omission is deliberate to allow the trade customs and practices of the various specialist sub-contracting trades to be followed. Thus in the case of electrical goods and materials, the electrical sub-contractor is entitled to charge for them according to the provisions of the Electrical Fair Trading Policy and to ignore the principle of "net cost subject to 5 per cent cash discount" referred to in Clause 22 of the R.I.B.A. Contract.

When an electrical sub-contractor is required to engage with the main building contractor, the appropriate form for the purpose is the "Standard Form of Sub-Contract" which, as in the case of Clause 21 of the R.I.B.A. Contract, deliberately avoids mention of prime cost or provisional sums. This form of sub-contract establishes the terms of contract between the main contractor (the building contractor) and his specialist sub-contractors. The sub-contract is issued under the sanction of the National Federation of Building Trades Employers and the Federation of Associations of Specialists and Sub-Contractors.

The electrical contractor may be called upon to "supply and fix" or only to "fix." He should, however, take note of the fact that if the main building contractor pays him within the time prescribed by Clause 24 of the R.I.B.A. Contract, i.e. within fourteen days of the receipt of the architect's certificate, the main building contractor will deduct 2½ per cent from his account.

Standard Form of Sub-Contract

A further point on which there has been a misunderstanding is that part of Clause 3 of the Standard Form of Sub-Contract which reads:—

> "The Sub-Contractor shall observe, perform and comply with all the provisions of the Main Contract on the part of the contractor to be observed, performed and complied with so far as they relate and apply to the sub-contract works (or any portion of the same)."

From this wording it has been inferred that Clause 22 of the R.I.B.A. Contract applies to an electrical sub-contractor and that he is bound to allow the building owner trade prices for electrical goods and materials irrespective of the discount status (if any) of the building owner under the Fair Trading Policy. This is not so because, as explained earlier, the R.I.B.A. Contract is an agreement between the employer (building owner) and the main contractor (viz. the building contractor) and is not binding on any other party. In other words, the electrical sub-contractor who supplies and fixes or merely fixes as a nominated sub-contractor can disregard Clause 22, since his position is specifically provided for by Clause 21 of the same contract under the sub-heading "Nominated Sub-Contractors."

Conclusions

There is nothing in the R.I.B.A. Contract or in the Standard Form of Sub-Contract which requires a supplier of electrical goods or an electrical contractor respectively, to depart from the principles of the Electrical Fair Trading Policy. Quotations for electrical goods and materials to architects, consultants, builders and others involved in building contracts should, therefore, on all occasions, be in accordance with the requirements of the Electrical Fair Trading Policy; any attempts to impose conditions of supply in conflict with the Electrical Fair Trading Policy are unwarranted and should be resisted.

Notes.—It should be borne in mind that the R.I.B.A. Contract is not in general use in Scotland, where conditions in the building industry are regulated by the Scottish General Conditions of Contract and Mode of Measurement.

The Electrical Fair Trading Council (Sardinia House, Kingsway, London, W.C.2.) has issued a booklet, "Recommended Procedure in Quoting Architects and Consulting Engineers" (price 9d), amplifying the information on this subject set out in the Electrical Fair Trading Policy. It has also circulated an addendum slip amending the Policy which replaces Clause 2 in Schedules 1 and 4/12 and Clause 3 in Schedules 2 and 3.

Liquid Starters and Controllers

FOLLOWING the publication earlier this year of revised British Standards for motor starters and controllers and for field rheostats, the second revision since 1923 of B.S. 140 completes an up-to-date series for motor control gear and related equipment. This latest publication applies to liquid starters and controllers for the rotor circuits of slip-ring, synchronous induction and similar motors. Its scope has been extended to include models used for d.c. dynamic braking, reverse-current braking and slip regulation.

The basis of the standard ratings of both liquid starters and liquid controllers is specified, and standard sizes of liquid starters and controllers are recognised in terms of motor horse-power. Requirements for the temperature of the electrolyte at the maximum rate of dissipation and the cooling water circulation are also included. The design and constructional requirements cover many aspects, such as provision for earthing and earth continuity, limitations on the initial and the maximum motor line current, and the operating gear and interlocking devices.

Full details are included of the type and routine tests which the equipment must satisfy in order to comply with this standard. Two of the four appendices contain information and formulæ for the estimation of the horse-power-minutes capacity of liquid starters and of the horse-power dissipation of liquid controllers in terms of the motor rating and the required conditions of starting and speed control. Recommendations concerning the composition of the electrolyte and the information to be supplied to the manufacturer with an inquiry or order are the subjects of the other two appendices.

Copies of B.S. 140 : 1957 may be obtained from the British Standards Institution, 2, Park Street, W.1, price 5s.

The Radio Show

TELEVISION ATTAINS ITS MAJORITY

IT is customary among those of a discriminating disposition to look to the National Radio Exhibition to reveal the new techniques and trends in the domestic applications of electronics, and on that occasion we have seen from time to time the introduction of entirely new ideas that promise to revolutionise some section of the industry. This cannot happen every year, however, and in between these sensational events we see the results of the steady development that succeeds them as the new ideas are absorbed into everyday practice.

The twenty-fourth Radio Show, which opened on Wednesday at Earls Court, is in this latter category, but if there is nothing to match the sensational introduction last year of the transistor and the printed circuit, almost every exhibitor has something new and interesting to offer, even though all that is visible to the eye may be a change of styling and better value for money. Quite decidedly, advantage has been taken of new production techniques to keep prices down, and nowhere is this more evident than in the general run of what might be termed the standard type of receiver, where the prices are very competitive. F.M. programmes are now incorporated with radio and television receivers at prices no higher than last year's models without it.

Although the introduction of transistors last year created something of a sensation, they were rather new and untried, and they were in very short supply and did not really get going. A small number of portable radios that were actually sold were very economical to run, but they were no smaller than small valve portables and they sold on the score of novelty.

This year the transistor makes a significant impact in four applications: handbag-size portable radio, pocket-size radios, portable battery-operated record reproducers (some with 3-speed motors and one 4-speed), and car radios. This last might well prove to be the most important application in domestic radio, because it enables the troublesome vibrator to be dispensed with. This is achieved by using a "hybrid" mixture of valves and transistors which will work directly from a 12 V car battery. Special valves that will operate from a high-tension supply of 12 V are used up to the output stage of the receiver, and then power-type transistors working in push-pull from the 12 V supply drive the loudspeaker. In dispensing with the vibrator, its nasty buzz is eliminated as well. Because no power unit is necessary bulk and weight are reduced, and the only item of any size is the speaker.

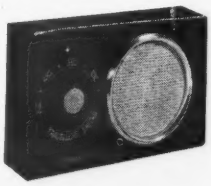
Hybrid arrangements of valves and transistors are also used in one or two portable receivers, and one firm exhibits a transistorised d.c. convertor unit that will supply h.t. current for an amplifier at quite a high voltage from a 6 V car battery, again supplanting the vibrator for such purposes as public address.

It is natural when considering the tiny dimensions of the transistor to look for really miniaturised pocket-size receivers, and although one or two prototypes were present at the Show last year they were kept strictly "under the counter." This year there are at least three makes actually offered for sale, and they will lie comfortably in the outstretched hand. They use a ferrite rod aerial which although very small is extremely efficient.

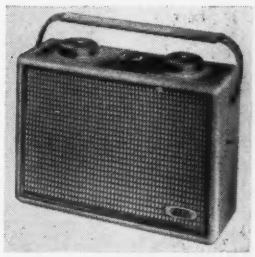
Several exhibitors show small, but not miniature, transistorised portable radios, and one of them quotes the running cost as one farthing a day. Most of these are of approximately the same dimensions as a lady's handbag, and there are other receivers of the same type and size using ordinary small valves. Often these are very attractively shaped and actually look like a handbag. These, of course, cost more to run from batteries than do transistors, but several can also be run from the mains. Quite a popular form of radio receiver is the mains/battery type of a larger size, though still portable, and these are made by almost every set maker.

Radiogramophones and good quality record reproducers, sometimes called electric gramophones, are still in very strong demand, and they are shown this year in

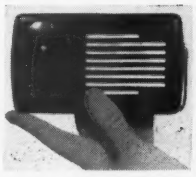
This H.M.V. 1410 "Mini-sette" uses a "hybrid" circuit of three valves and two transistors and weighs only 2¼ lb.



One of the miniature transistorised pocket portable sets is this Cossor 561 "Traveller's Friend," in a stitched leatherette case with a choice of colours. It uses four transistors and two crystal diodes and weighs only 17 oz



Typical of the handbag size two-band transistorised portable radio sets, the G.E.C. model BC1650 uses six transistors, a 6 × 4in elliptical speaker, and runs off an internal 6 V dry battery

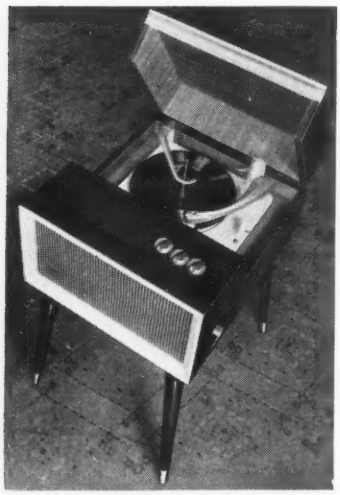


The first transistorised miniature portable radio set to appear on the British market is the "Perdio" (contracted from "Personal Radio"). It weighs only 13 oz and is only one inch deep

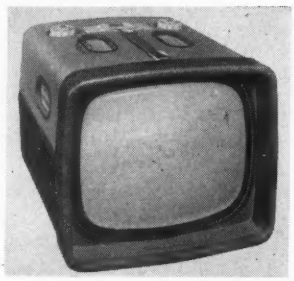
The Ferguson 343BU "Fawn" is an example of the handbag style of small portable radio set. Covering two wavebands, it works from a.c. or d.c. mains or from its self-contained batteries

A very competitively priced example of the popular mains-operated record reproducer—the Marconiphone R70, with four speeds

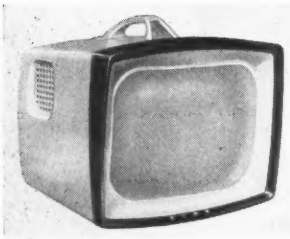
A representative model of the numerous low-priced record reproducers. The "Tunetime," made by Kolster-Brandes, has a 4-speed automatic record changer



An example of the better class record reproducer available at a medium price, is provided by the Alba 887



One of the new transportable television receivers is this H.M.V. 1864. It has a telescopic aerial, and a 14in tube



The Alba 909 is a new transportable television receiver fitted with a 14in tube

Two six-section pivoted telescopic elements forming an adjustable V-shaped aerial are built in on the Ferguson 45 transportable 14in television receiver

The McMichael MP14DL "Venturer" transportable 14in television set with its telescopic aerial attached

very great variety. Often quite high quality amplifiers are fitted in them with several loudspeakers, and the quality of reproduction should satisfy the keen gramophile. In their more expensive forms they are housed in very handsome cabinets and associated with a television receiver or a tape recorder.

A tremendous market has grown up for a cheaper variety of record reproducer, the portable type, which is bought mainly by "teenagers" to play dance records, and it is hardly an overstatement to say that every set maker displays one or more of this type of instrument, the prices starting off as low as just under £14, including tax, while there are several at around £20. They practically all are mains operated and play at four speeds. Transistorised battery-operated record reproducers are shown, some with multi-speed motors, and there is a radiogram. Two types of motor are used that will work from 6 V dry batteries, one using a rheostat for speed control and the other a centrifugal governor.

High-class and "luxury" type equipments are more numerous than usual, but their prices are quite within reason. They all have high quality record playing equipment, and there may be associated with it an A.M./F.M. radio, or a television receiver perhaps with F.M. radio in it, or a magnetic tape or disc reproducer, and there are models with all three. The combination of television and records, without radio, is quite a novel development.

Frequency-modulated transmissions of radio at V.H.F. giving all three B.B.C. sound programmes are now available in most parts of the British Isles, and what might be called the "standard" radio receiver now almost universally has A.M./F.M. tuning, a small minority of A.M.-only models being sold in those small areas that are still out of range of the F.M. transmitters. It is common practice to include an internal ferrite rod aerial for A.M. reception and a compressed dipole for F.M., but often the latter is used in areas where the signal

strength is too low to do the set justice, and to avoid the resulting distortion one firm supplies a simple picture rail aerial with its receivers that can easily be suspended from the wall to improve reception. Quite a number of radiograms use F.M. radio only, taking advantage of the better quality available.

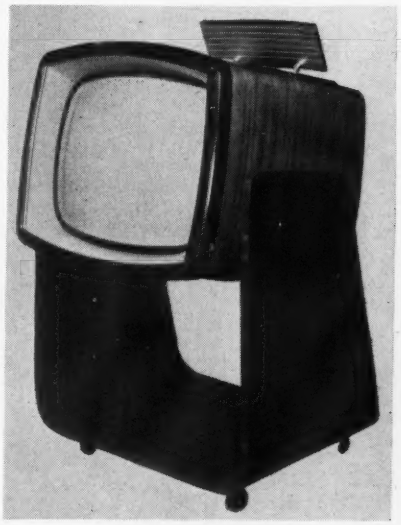
The tendency was noticeable last year to provide F.M. radio with television receivers. This was not inspired so much by a surge of interest in radio/television combinations, which in the past have been very expensive, but was due to a natural affinity between television and F.M. radio, which are both transmitted in the V.H.F. region. The modern television receiver can easily be adapted to work from a F.M. sound signal, and the turret tuner that is now common can quite simply be provided with tuning circuits for V.H.F. radio.

The result is that V.H.F. radio can be added to a television receiver for an additional cost of five or six guineas, giving a television/radio combination at very little more than the cost of the television receiver. One leading manufacturer introduced this method two years ago, and last year it was taken up by three or four other set makers, but this year a large number of them offer models with this valuable facility in quite low-priced models. Two of them add to it a gramophone turntable and thus convert it into a television radiogram at quite a reasonable price.

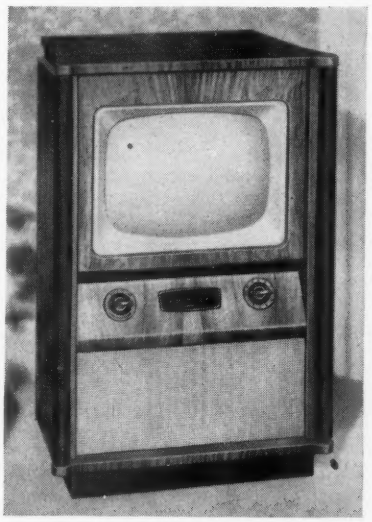
This year television celebrates its coming of age, the first public television service in the world having started in 1936 at Alexandra Palace, and it is significant to record that, apart from ancillary appendages such as V.H.F. radio, the design of television has in its 21st year established quite a fair degree of stability. Refinements are still being added, but there is a greater degree of uniformity between different models and makes.

What is a source of wonderment to people who know just what goes into a television receiver is that manufacturers can keep the prices at their present levels, and indeed actually lower them. A common price at the Show to-day in leading makes for the 17in receiver, which is by far the most popular size, is 69 guineas, which is actually about 5 per cent lower than it was last year. This has been achieved in the face of the rising cost of labour and materials, and it is a great tribute to the ingenuity of the designers and the honesty of manufacturers.

Obviously great efforts have been made to achieve manufacturing economies in all directions. The two major items of cost are cabinets and cathode-ray tubes, and economies have been effected in both. Money can be saved by moulding cabinets in plastics, but that is not to everybody's taste. The cabinet makers have introduced the " wrap-round " technique, however, by which cheaper cabinets can be made of real woods with close-fitting



Novelty and practicality are embodied in this Murphy " Swingscreen " consolette cabinet (V310). The 17in television receiver is pivoted so that its screen can be tilted to the most convenient angle



The Ekcovision TCG316 " Tele-Gram " takes advantage of the provision of F.M. radio on the TV turret tuner to add an automatic record changer and so constitute a 17in television radiogramophone combination. The full-length doors fold back against the sides

A 17in television receiver with F.M. radio on the turret is combined with an automatic record changer in this Decca luxury model 555, the " Tele-Radio-Gram." It has " glide away " tambour doors which slide out of sight and modern style legs

compactness and attractively rounded corners in which much waste is avoided. Cathode-ray tube prices have been reduced, and wide-angle deflection, in shortening the length of the tube, permits a shallower depth of cabinet, with a further saving in expensive timber.

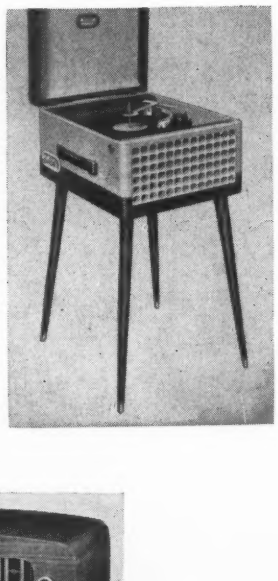
Many cathode-ray tubes no longer require focus magnets, thus saving their cost and simplifying operation because no focus adjustment is necessary. Several set makers have used varying degrees of printed circuit, and one who prints almost the entire circuit shows a 17in receiver at 63 guineas. To achieve the convenience of console cabinets, yet avoid their high cost, most firms now offer with their table models optional legs or a small table at an extra cost of about three guineas.

Excluding portable models, the 14in receiver has been almost eclipsed at the Show by the 17's and 21's; of well over 200 different models that are exhibited, only 20 have 14in tubes, while over 120 have 17in tubes. There is only one 14in console. The 14in table models run at about 10 guineas less than the 17's, but there is one as low as 54 guineas. Although well represented at the Show 21in receivers have not become as popular as had been anticipated. They seem to sell best in cabinets of the semi-luxury type at well over the £100 mark, although there is a table model at about £90 with a wrap-round cabinet and optional legs.

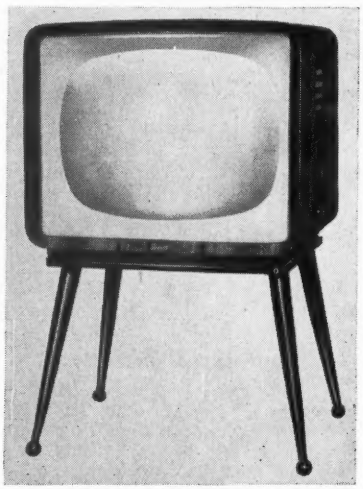
Another recently-introduced feature that appears likely to set a new fashion in television receivers at this year's Show is the transportable model, which can easily be moved about the house. These are shown by nearly a dozen exhibitors. Most of them use a 14in tube, but there is one 12in model (approximately same size picture) and one 9in. This last is a nursery set weighing only 17 lb and providing a handy "second" set at 45 guineas.

In this connection it is interesting to observe that aerial manufacturers have been busy designing aerials that can be stood on the receiver or hung on the wall, where they will work with any kind of set in an area of high signal strength. With the vagaries of indoor aerial performance in mind, one designer has made his aerial V-shaped, but each rod is telescopic and hinged at the base so that the length and position of each arm can be adjusted to work on Band I and Band III. One transportable receiver has a similar aerial permanently fitted to it. An aerial is actually concealed inside one table receiver.

The Belling-Lee "Golden V" indoor television aerial for Band I and Band III has two telescopic elements which are independently hinged at the base. The best positions can be found by adjusting the length and angle of each arm



By an ingenious application of the popular detachable leg technique Decca convert their "Auto-Deccalian 88" portable record reproducer into what is virtually a consolette



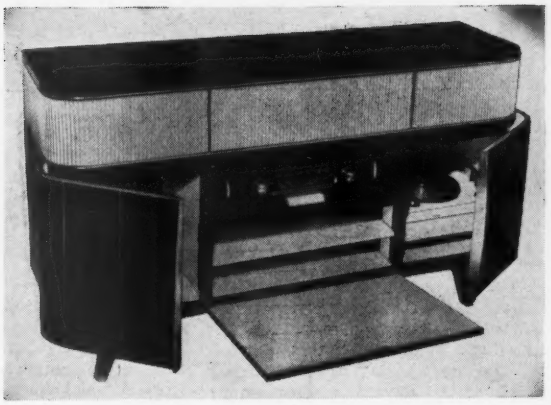
The modern trend in television cabinet design is exemplified in this Sobell table receiver in a "wrap-round" cabinet with optional legs. It is model T22, with a 90 degree 21in tube and flywheel synchronising

The bentwood cabinet technique is combined with the modern leg fashion to make an attractive consolette A.M./F.M. radiogramophone in the Kolster-Brandes OG10 "Minor"

The printed circuit technique, which was introduced last year, has since been widely adopted by radio manufacturers, especially for small receivers and record reproducers. Although a small number of television manufacturers have used the process, it is by no means as widely used by them as in radio. Most small portables, and it seems every transistor model, are made by that process, which appears to find favour in the smaller assemblies.

Manufacturing economies have not been allowed to affect chassis design adversely. In fact, more attention is given now than ever before to the needs of service work. Slots are cut in the cabinet to permit the removal of the armoured glass screen in front of the tube for cleaning purposes. Most chassis are readily accessible even without removal from the cabinet, and in two cases at least the line output transformer has plug-in connections, permitting replacement in a matter of seconds. This hard-worked component might be called the heart of the

A magnetic tape recorder, an A.M./F.M. radiogram and an electric clock form a luxury combination console in the Ferguson 403



Impressive cabinet design in Continental style marks this luxury Regentone ARG150 A.M./F.M. radiogramophone

modern television receiver, and in the past replacement could take up to half-an-hour.

Thought has been given to the pocket of the service engineer, too. Two exhibitors show constructors' kits for making up into high-grade servicing instruments like multi-range valve voltmeters and oscilloscopes. High grade might sound an exaggeration, but the quality of the components is high, and they are mounted on to a printed circuit panel, by which means the manufacturers are able to guarantee their performance, yet their cost is about half that of an equivalent factory-made instrument.

For the amateur keen on good musical production there is a greater range than ever of amplifiers, pick-ups, motors and speakers, including a new full-range electrostatic speaker. Cabinet manufacturers now cater for him, offering cabinets designed specially to house his equipment tidily, and sets of matching cabinets are made for amplifier, speaker, and records. One firm supplies these in kit form. But even the family man and his wife who are not interested in the insides of electronic instruments will find plenty to see and hear at the Show, and there is enough going on to entertain their children as well.

Consultation in the Supply Industry

THE progress made by the National Joint Advisory Council of the Electricity Supply Industry is detailed in its annual report for 1956-57, copies of which are available from the secretary at Winsley Street, London, W.1.

The National Council made thirteen recommendations during the year on matters concerning education and training, safety, health and efficiency, and up to 31st March last had made in all 150 recommendations. Most of the Council's time in earlier years was spent preparing major schemes affecting education and training and safety, health and welfare of employees, but the number of recommendations to the C.E.A. and the Area Boards has fallen. The scope of the Council's work, however, has increased and it has received and discussed some reports on general developments in the industry and on matters in the fields in which it has a primary responsibility.

The District Councils again spent more time discussing education and training than any other subject, although such matters as safety, efficiency and welfare were frequently dealt with. All Councils discussed in detail the constitutional changes resulting from the new National Agreement for Joint Consultation in the Electricity Supply Industry (summarised in our issue of 24th May last), which became effective on 1st April this year. There was a marked increase in the number of subjects raised by the Council members. The District Councils made a total of 25 recommendations (12 originating with the Local Advisory Committees) to the National Council, and 112 recommendations to Area Boards (45 originating with the L.A.C.s). These recommendations covered a wide variety of subjects, principal among them being recruitment and training of apprentices, accident statistics, the educational incentive scheme, and manual workers' benevolent funds and traineeships.

On 31st March, 1957, there were 443 Local Advisory Committees in the industry in England and Wales, an increase during the year of ten committees. The development of the Committees continued broadly on the same lines as described in earlier reports. Of the subjects discussed, efficiency was the most frequent by L.A.C.s in nine districts, and was second in order of frequency in the remaining three districts; safety was next in order, followed by education, training, welfare and health.

The rapid growth in the number of Local Advisory Committee Boiler Overhaul Sub-Committees led to an inquiry at the end of 1956 into the work done by these sub-committees. Ten stations were chosen for the inquiry, and the conclusions arrived at were that sub-committees contribute to the more efficient overhaul of boilers and to an improvement in human relations in power stations.

Dealing with the Electricity Supply Scholarship Scheme, the report states that while the number of applications from technical employees remained fairly steady in 1956-57, during the last two years there has been a fall in the number of applications from clerical and administrative and manual employees. The decline in manual workers' applications is attributed partly to the growth of the manual workers' traineeship scheme, and it is suggested that on the clerical and administrative side the fall may have been due to the fact that possible applicants have learnt that universities are becoming increasingly reluctant to accept those who have only professional qualifications unless they pass an examination of matriculation standard.

There was an increase both in the number of suggestions received and in the number of awards made. The National Council approved a new departure in the Suggestion Scheme. In the North Eastern Division a pilot scheme will be launched under which employees will be invited to make suggestions for solving problems specified by the Division.

NEW ELECTRICAL EQUIPMENT

Process Timer

AIRMEC, LTD., High Wycombe, Buckinghamshire, have recently announced the introduction of a new process timer (type N.237) for industrial control purposes over the range of 1-100 seconds. The timer resets itself automatically, the start signal for the timing period may consist of either the connection or disconnection of a pair of contacts, and three or more timers may be operated in a ring. The system is similar to the tandem connection but the last timer is arranged to restart the first so that the process continues indefinitely. The manufacturers claim that the scale calibration accuracy is better than ± 3 per cent and that a change of mains input voltage of ± 10 per cent will not affect the interval time by more than ± 5 per cent. The dimensions of the instrument are $6\frac{1}{8}$in wide by $5\frac{1}{4}$in high by $4\frac{1}{4}$in deep.

Laboratory D.C. Testboard

A new laboratory d.c. testboard has been designed in collaboration with Siemens Edison Swan, Ltd., and is being manufactured by P.A.M., LTD., at their new Merrow factory, nr. Guildford. It is primarily intended for testing high voltage rectifying valves, thyratrons, and other thermionic valves during stages of development and investigation.

Stabilised h.v. supplies, bias voltages, and heater current are available from the various units, and ample metering facilities are provided for making accurate measurements while a valve is under test. Instrument protection in case of short-circuits or overloading is one of the special features. Angled mirrors around the valve under test allow the operator to inspect the electrodes, while electrical data are compiled from the indicating instruments. Complete protection facilities are incorporated to ensure safety of personnel during the operation of high voltage circuits.

Low Voltage Transformer

Recently introduced to their range of transformers by AGRO ELECTRICAL CO., LTD., National House, 60-66, Wardour Street, London, W.1, is a metalclad low voltage transformer complying with the requirements of B.S. 794. The transformer is suitable for such applications as machine tool lighting, running small motors and alarm bell systems. The primary is wound for connection to 200/250 V, single-phase supplies, and the secondary, which gives a continuously rated output of 50 VA, is available in three alternative windings as follows: Catalogue No. 2951, 4 A at 12 V; No. 2953, 2 A at 25 V; and No. 2955, 1 A at 50 V. The price is £2 9s in each case. Primary windings of 400/440 V are also available against special orders and the transformer unit can be supplied separately for building-in purposes.

Germanium Rectifier Stacks

A new range of rectifier stacks with an operating efficiency of approximately three times that of the selenium type of rectifier is now available from the GENERAL ELECTRIC CO., LTD. The range is based on highly-efficient medium-power germanium diodes, type GEX541, in various series, parallel, and series-parallel arrangements. The rectifier stacks provide d.c. supplies for medium power requirements up to about 30 kVA. In addition to a higher rectification efficiency the new units offer a number of advantages over the older type of semi-conductor rectifier. These are: better regulation characteristics, less weight and smaller size for similar power ratings, constancy of performance, and the ability to work under adverse climatic conditions.

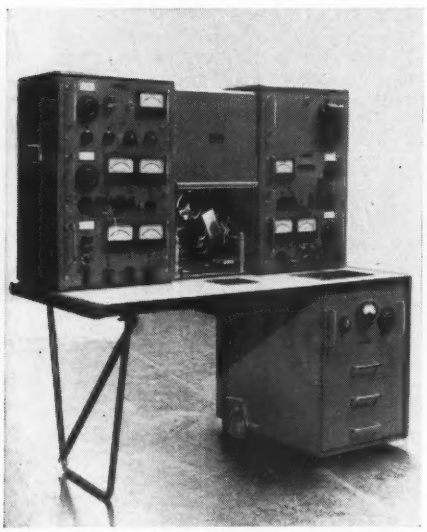
The rectifiers are available in a range of standard stacks for operation up to a maximum ambient temperature of 55 deg C. The addition of cooling fins to a stack will increase the power-handling capabilities, but the use of either finned or unfinned stacks for a specific application will depend principally upon both cost and space considerations.

The device is suitable for use in any type of power-rectifying circuit for single-phase, three-phase or hexaphase operation. Power requirements of up to about 30 kVA are economically handled by finned units using series and parallel diode connections.

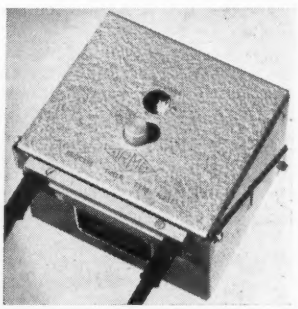
Burner Control Box

A new burner control box, the "Spediflam II," introduced by TEDDINGTON INDUSTRIAL EQUIPMENT, LTD., incorporates a number of advanced features. It will be fitted to the oil burners used to fire the boilers for the heating plant at next year's Brussels Fair.

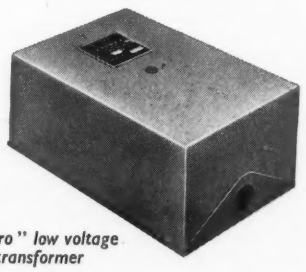
A reset button which is positively isolated from the control circuit until the full purge period has elapsed ensures constant purging time under all conditions. In addition, there is a positive timed ignition period after flame is established and a specially designed constant torque magnetic clutch for rapid shut-down on flame



Laboratory d.c. testboard



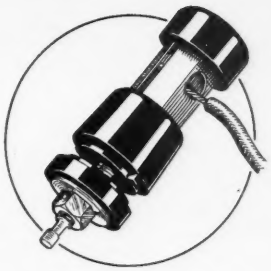
Process timer by Airmec



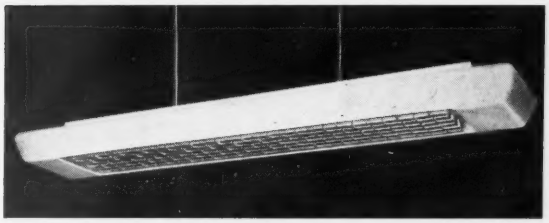
"Agro" low voltage transformer

G.E.C. rectifier stacks showing use of fins to increase permissible current rating

British Klockner distribution control panel



Spring loaded terminal (Howard S. Cooke)



The "Roding" fluorescent fitting from the Falk, Stadelmann "Thames" range

Newton Victor "Raymax 50" tubehead, bench mounting stand and control unit

failure with minimum temperature drop. Low voltage and high voltage terminal blocks have been incorporated on opposite sides of the chassis, giving increased electrical safety. The ignition transformer and burner pump motor are energised simultaneously by one master relay with self-cleaning contacts. The thermal "Spediflam" will stop the burner within 30 sec of flame failure and the photo-electric type within half a second.

The overall size of the unit is only 6½in by 5in by 3¾in with a total weight of less than 5 lb. The box is coated with an easy-to-clean finish in hammer gold, the drip-proof case being fixed by a single screw. The cover has an illuminated re-set button and can be removed in seconds to give complete all-round accessibility. Other special features include chassis-type construction, concealed wiring, built-in radiation shield, easy wire terminals and the timers shielded in transparent "Perspex."

In addition to the combined model, separate control units are available for panel or wall mounting. One model is arranged for use with the "Flutector" stack switch while another, in the same size case, has a built-in electronic amplifier for use with the Teddington "Sensiteye" flame detector. This model is designed for larger boilers where instantaneous shut-down on flame failure is required, and is available with or without purge timer. "Sensiteye" photo-electric flame detectors can be supplied either with side viewing or end viewing cells.

Radiographic Unit

A new radiographic unit known as the "Raymax 50" has recently been developed by NEWTON VICTOR, LTD., X-ray Department of the Metropolitan-Vickers Electrical Co., Ltd., 132, Long Acre, London, W.C.2. This new development will meet the demand for an instrument capable of producing very "soft" radiation so that minute changes in the density of the specimen will be clearly shown. It is suitable for microradiographing since the fine focus and stepless kilovoltage control enable sharply defined very high contrast pictures to be produced which can then be photographically enlarged. Other applications are the examination of documents, old paintings, grain for infestation, for checking spot welding joints in thin gauge aluminium, and for examining low density plastic mouldings for porosity and voids.

The instrument consists of a transformer tubehead and control box. The control unit, which is fitted with a carrying handle, can be fixed to a wall or stood on a bench, and for some applications it is convenient to mount the tubehead on a small lead-lined cabinet. In other cases a simple tube mounting stand, as illustrated, can be supplied.

Off-Peak Load Control Panels

Distribution control panels for off-peak thermal storage and space heating control, suitable for single-phase loads up to 12 kW, are now available from BRITISH KLOCKNER SWITCHGEAR, LTD., Chertsey, Surrey. They consist of a four-way, or alternatively six-way, rewirable fuse board with neutral and earthing bar, double pole 60 A isolator and single pole 60 A air-break contactor fitted with solid silver contacts, complete with control fuse. A socket is also provided ready for inserting a Venner time clock.

The housing is of steel construction, finished in cream enamel, and the design is such that the whole of the interior may be withdrawn by slackening the holding screws. Installation is thereby simplified, as the whole of the equipment may be completed before the panel is inserted and connected. As the housings may be mounted separately from the panel, it is possible to mount for entry either from above or below. The fuse cover is removable and also discloses an inspection opening for the time switch; this opening is fitted with a "Perspex" window which can be removed by the installation engineer if the time clock is to be available to the consumer. Fuse ways may be made up of 5 A, 15 A, or 30 A non-interchangeable fuses.

Fluorescent Fittings

A new range of fluorescent fittings, the "Thames," has been announced by FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1. Designed to provide a range of 30 fittings from a small number of basic parts, they comprise five simple designs, the "Fleet," "Wandle," "Ember," "Roding" and "Darent," and each is available for 2, 3 or 4 lamps in 5ft 80 W or 4ft 40 W sizes. The fittings are so constructed that the body, complete with louvre or diffusing panel, can be easily detached from the channel by one person. They may be fixed either direct to the ceiling or be used as pendants with the special "Thames" suspension set. The control gear is of the high power factor quick-start type and is available for 200/220, 230/240 or 240/250 V. The metal parts of the fittings have a stove-enamelled off-white eggshell finish. Prices range from £19 16s 4d (2 × 4ft 40 W "Fleet") to £37 7s 4d (4 × 5ft 80 W "Roding") plus £2 18s 5d and £4 18s 2d, respectively, for purchase tax in the United Kingdom.

Spring Loaded Wiring Terminal

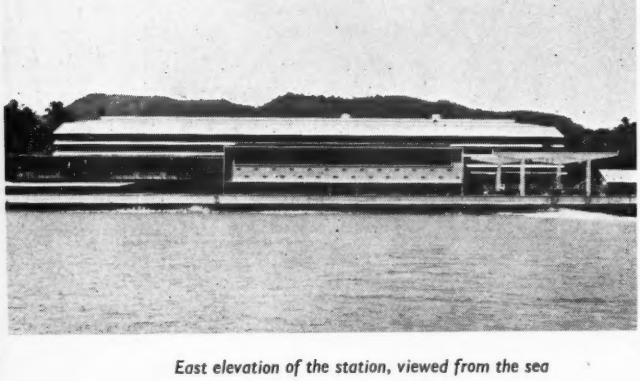
A spring loaded terminal of the type which traps the end of a wire (or termination pin) inserted transversely through the terminal body has recently been introduced by HOWARD S. COOKE & CO., LTD., Arrow Road, Redditch, Worcs. It is designed for mounting on panels up to ⅛in thick and accepts wire or pins up to ¼in diameter and provides secure connections; it is also safe against vibration. The terminal, which protrudes only ⅞in from a panel surface, has a low contact resistance, a current rating of 5 A and a test voltage of 1,000 V r.m.s. Application has been made for type approval. Metal parts are all nickel plated brass and mouldings are in X20/5 thermo-setting material which may be in black or red.

NEW PENANG POWER STATION

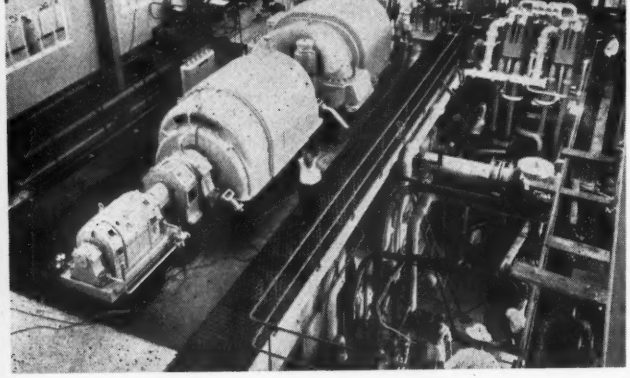
ONE of the smaller electricity undertakings in Malaya is that of George Town (Penang) which at the beginning of this year was granted city status by Royal Charter. A few days afterwards the new Penang power station was officially opened by the Minister for Natural Resources and Local Government, the Hon. Enche Suleiman bin Dato Abdul Rahman.

Mr. M. B. Parsons, A.M.I.E.E., the city electrical engineer, who has sent us a number of photographs of the station, tells us that rapid progress has been achieved by the various British contractors under the supervision of the consulting engineers, Messrs. Preece, Cardew & Rider. The initial installation comprises two 10 MW English Electric sets and a third now under construction is considered as the first extension. The ultimate designed capacity is 50 MW of steam plant, with provision for an internal combustion engine set. The steam raising plant, for which the contractors were Foster Wheeler, Ltd., comprises three 130,000 lb/hr water tube boilers with steam conditions of 425 lb/sq in and 825 deg F. The boilers are oil-fired, the oil being drawn from a main below the firing aisle by motor driven pumps and passed through steam heaters to reduce its viscosity. The contractors for pipework, pumps, auxiliary services, etc., were Babcock & Wilcox, Ltd., and for the switchgear, transformers, and cables A. Reyrolle & Co., Ltd. (sub-contractors for transformers, C. A. Parsons & Co., Ltd.; cables, W. T. Henley's Telegraph Works Co., Ltd.; contactors, Contactor Switchgear, Ltd.; and batteries, Chloride Batteries, Ltd.). In the first six months' operation of the station 23·9 million kWh was sent out.

Interior of the control room at the new Penang power station of George Town City Council



East elevation of the station, viewed from the sea



No. 1 generator after completion of commissioning tests

The undertaking has a surprisingly long history, the first supply having been given on 14th July, 1904, to 15 consumers and 41 arc lamps for street lighting. In its report for 1956, the 52nd year of working, it records an increase of 1,785 in the number of consumers supplied, the largest since the war, a fact which reflects the amount of new building activity in all parts of Penang Island. At the end of the year consumers numbered 26,763. Sales, at 41·8 million kWh, were only slightly more than in 1955, however, limited generating plant having necessitated the imposing of restrictions on the use of certain types of apparatus during the evening peak load period.

Revenue amounted to nearly $6 million and there was a net surplus of $835,276. This was rather less than in the previous year owing to increased interest payments, expenditure on capital account last year having amounted to $10·5 million.

Research for Industry

A REPORT on the survey of industrial research in progress in technical colleges during the academic year 1955-56 has recently been published by the London and Home Counties Regional Advisory Council for Higher Technological Education.

The report is concerned only with research done in consultation with or of direct benefit to industry. It shows the striking development of collaboration between industry and the technical colleges on many diverse projects.

The contribution made by local education authorities in appointing research assistants in technical colleges and the generosity of industrial associations and firms in helping to enable research to be undertaken by technical colleges have already proved highly beneficial.

The report, which may be obtained from the secretary of the Council, Tavistock House South, Tavistock Square, London, W.C.1, is priced at 1s 6d.

Labour and Industry

Agenda for the Trades Union Congress

FROM A CORRESPONDENT

THE final agenda for the Trades Union Congress, to be held at Blackpool next week, and the General Council's report to Congress indicate that, except for the Transport and General Workers' Union's and the Electrical Trades Union's motions on wages, it will be a fairly quiet Congress.

The former motion charges the Government with failure "to deal effectively with the problem of prices and profits." It "accordingly rejects the principle of wages restraint in any form and reaffirms the determination of the Trade Union Movement, while prices and profits remain uncontrolled, to take such steps, industrially, as will ensure that wages will keep pace with rising costs." Milder perhaps in its choice of words, the E.T.U. motion is just as strong in content; it reasserts the right of the trade unions to negotiate freely increased wages and "use their bargaining strength to protect the workers from the effects of Government economic policy." A National Wages Board "would undermine the established machinery and procedure of free negotiations."

Co-ordination of Fuel and Power

Congratulating the National Coal Board and the Central Electricity Authority on the successes achieved in their respective industries, a motion by the Association of Scientific Workers calls for more detailed co-ordination of power production from the three main sources, coal, gas and electricity, so as to minimise overlapping and keep the use of imported oil and coal to the minimum, and the application of existing knowledge to secure greater efficiency in the use of fuel both in the industrial and domestic fields.

The only motion on automation is in general terms. It comes from the Association of Engineering and Shipbuilding Draughtsmen and says that increased production must be used to benefit the whole community and improve the conditions of the workers. The motion urges the General Council to keep the matter under review and exchange information with affiliated unions.

Nationalisation and public ownership occupy a modest position in the agenda compared with previous Congresses. The Association of Engineering and Shipbuilding Draughtsmen believes that the greater part of the machine tool industry should be brought under public ownership, while the Amalgamated Union of Building Trade Workers wants the General Council, the Labour Party and interested unions to "design a plan at the earliest possible moment for the public ownership of the building and building materials industries."

There is one solitary motion on technical education. The Association of Supervisory Staffs, Executives and Technicians calls upon the General Council to approach the Government, to urge that basic educational standards be raised by an increase in the number of comprehensive and technical schools; that steps be taken to attract into the technical teaching profession more qualified men and women through improvements in salary scales and conditions; and that suitable schemes for the day release of young people in industry beyond the age of 18, where necessary, should be initiated under joint control of the Ministry of Education and Youth Employment Service to enable such young people to study for technical qualifications.

General Council's Report

The General Council's report is always a cautious document. And this year's report is no exception. It has a lot to say on a variety of subjects, but most of the matter is explanatory. It does, however, express the opinion "that in the next ten to twenty years the provision of nuclear power, of itself, would not keep pace with fuel and power demands." It is the view of the General Council that so great is the rate of technical advance that the present nuclear power stations are likely to be out of date in five years' time.

The report contends that the Government has no fuel and power policy. The weighting of the nuclear power programme has not been sufficiently explained or related to developments and requirements in other fuel industries. The National Production Advisory Council on Industry has agreed to accept a statement on the subject from the General Council.

It is considered that in view of the increasing use of production and management techniques in industry there is a responsibility on trade unions to ensure that their negotiators are familiar with the technology and at least have an understanding of the theory and principles of the techniques, otherwise they may be at a disadvantage in joint discussions and negotiations.

The General Council's attitude to the European Free Trade Area remains substantially the same as set out in the statement submitted to the Government last November. At a subsequent meeting with the President of the Board of Trade the General Council stressed the "importance of ensuring that all member countries adopted full employment policies, the use of escape clauses, and the position of the Colonies." In June the Council submitted to the Chancellor of the Exchequer a draft clause relating to the general obligation of member countries to maintain full employment.

On 30th September the Labour Party Conference opens at Brighton. On the preliminary agenda are no fewer than 443 motions. As I stated last year, much less than half have any chance of reaching the conference floor, and many of these will become almost unrecognisable, when they have passed through the hands of the Conference Arrangements Committee. The motions sent in do, however, reflect the mood of the rank and file members of the party, even if they play little part in the determination of ultimate policy.

B.S.I.R.A. Open Days

THE British Scientific Instrument Research Association states that the interest shown in its forthcoming series of open days, originally planned for 7th to 11th October, has been so great that the period has now been extended to include Monday, 14th October. Admission is by invitation only and inquiries should be addressed to the Director.

GENERATION AND DEVELOPMENT

Area Boards' Sales

Electricity sales by the twelve Area Boards in England and Wales last month are analysed in the accompanying table. The national figures show an increase over July, 1956, of 8·0 per cent, but, when corrected for weather conditions and working days, the increase is 6·3 per cent.

ELECTRICITY SENT OUT BY AREA BOARDS FOR THEIR CONSUMERS

Area Board	Totals for July (million kWh)			Twelve Months' Totals Ended 31st July (million kWh)		
	1956	1957	Inc. or Dec. %	1956	1957	Inc. or Dec. %
London	415·5	435·2	+ 4·7	6,846·4	6,935·4	+1·3
South Eastern	283·4	298·4	+ 5·3	4,316·8	4,457·9	+3·3
Southern	345·9	385·0	+11·3	5,174·6	5,538·4	+7·0
South Western	192 5	205·5	+ 6·8	2,655·0	2,790·0	+5·1
Eastern	454·0	486·2	+ 7·1	6,853·8	7,196·9	+5·0
East Midlands*	418·3	446·8	+ 6·8	5,892·1	6,147·0	+4·3
Midlands*	523·6	574·9	+ 9·8	7,683·2	7,818·6	+1·8
South Wales*	334·9	371·2	+10·8	4,455·2	4,660·1	+4·6
Merseyside and North Wales*	341·5	370·7	+ 8·6	4,614·5	4,841·8	+4·9
Yorkshire*	551·6	602·6	+ 9·2	7,664·0	8,032·2	+4·8
North Eastern*	321·4	348·8	+ 8·5	4,397·8	4,641·1	+5·5
North Western*	555·8	586·2	+ 5·5	8,139·0	8,307·6	+2·1
Total all Area Boards	4,738·4	5,111·5	+ 7·9	68,692·4	71,366·9	+3·9
Direct Supplies by Central Authority	178·0	199·2	+11·9	2,117·7	2,281·3	+7·7
Grand Total	4,916·4	5,310·7	+ 8·0	70,810·1	73,648·2	+4·0
Mainly Industrial Areas*	3,047·1	3,301·2	+ 8·3	42,845·8	44,448·3	+3·7
Mainly Non-Industrial Areas	1,691·3	1,810·3	+ 7·0	25,846·6	26,918·6	+4·1

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

1,000 MW Station at West Thurrock

The Central Electricity Authority has received the consent of the Minister of Power to the establishment of a new power station at West Thurrock, Essex, which will have an installed capacity of 1,000 MW. The installation will comprise five 200 MW turbo-generator sets and five 200 MW re-heat boiler units, each having an evaporative capacity of 1,400,000 lb/hr. The West Thurrock station is planned to be brought into commission by the winter of 1961.

Power Supply to Hinkley Point Site

Work is going ahead rapidly on the erection of overhead lines to the site of the nuclear power station to be built at Hinkley Point in Somerset for the Central Electricity Authority. These high voltage lines will provide initial power supplies for construction work on the site.

This was announced in Taunton last week by Mr. E. A. Newburn, sub-area manager of the South Western Electricity Board. He said that the Board was taking two 33 kV lines to the site and would install terminal switchgear and transformers there. This work was being carried out to an exacting timetable, initial supplies being required by the autumn. The power needed for the construction stage of the project would be equal to that required for a small town, necessitating the reinforcement of the Board's existing high voltage system in the vicinity by the erection of an additional 33 kV line from the Taunton main supply point to Bowhays Cross substation at Williton.

The *Western Gazette* reports that work is ahead of schedule on the construction of a six-mile approach road to the site of the nuclear power station.

Preliminary Work Starts at Hunterston

Site work began on the South of Scotland Electricity Board's Hunterston atomic power station on 22nd August. Initial work includes the felling of trees on the route of an access road, using floodlighting to allow 24-hour working. This road runs from the main Fairlie-Seamill road to the site of the new station. Some 2,200 workers will be employed on the project when construction is at its peak. Completion is expected by 1961. The contract for the £37 million scheme was awarded to the General Electric Co., Ltd.

Plymouth Reinforcement

To increase the capacity of the network in Plymouth and the surrounding rural area, and to provide greater security of supply, a £207,000 reinforcement scheme is being undertaken by the South Western Electricity Board. Mr. N. Axford, the Board's manager for the Plymouth District, said last week that the system voltage was being raised from 6·6 to 11 kV, the change-over being carried out in three stages. Half the first stage, covering areas north and east of the city from Crownhill to Ivybridge, should be completed by September. Work was also going ahead on the second stage which covered the rural network north of Plymouth, including the new housing estates. This stage should be completed by March next year. The third stage, which included the change-over of the network in the whole of the east of the city, would not be finished until March, 1959.

Stella-Spennymoor Line

The Central Electricity Authority is to construct a 132 kV overhead line from Stella South power station, near Newcastle-on-Tyne, to Spennymoor substation in south Durham and plans have been approved by the planning authorities.

Gateshead Householders' Predicament

Gateshead Town Council and the North Eastern Electricity Board are considering the position of householders in Forster Street, Hector Street and Wylam Street, Gateshead, whose houses were wired for electricity about 18 months, but who cannot use their installations, because cables have not been laid. The householders were approached at the outset by the representative of an electrical firm who, they say, gave them to understand that the Electricity Board was shortly to lay cables in the area. When the Board was later asked about the matter, however, it stated that there were no plans for laying cables in the streets involved.

The houses concerned are old terrace dwellings and will eventually be demolished. The Electricity Board is prepared to consider supplying power if an undertaking is given that the houses will not be pulled down for at least ten years.

OVERSEAS

Large Congo Scheme

An ambitious scheme for the development of power from the Congo River at Inga in the Belgian Congo is being drawn up by a committee which is expected to report next month. It is reported that the first stage of the project would be the installation of plant with a capacity of between 1,250 and 1,500 MW extendable to 2,400 MW. The cost is put at £150 million and this stage would take about eight years to complete. It has been claimed that it will be possible to sell power from the Inga plant at about 0·2d/kWh in the initial stage and at as little as 0·11d when the second stage is completed.

New Zealand Supply Authorities

The Electrical Supply Authorities Association of New Zealand has sent us a printed address list of electricity supply organisations in that country.

It includes the State Hydro-Electric Board, Electric Power Boards, City, Borough, County and Town Councils, and companies. The chairmen and principal executive officers are named and besides the authorities' postal addresses and telephone numbers, the call signs and frequencies of their radio transmitters are given.

Thai Power Project

The International Bank for Reconstruction and Development has approved in principle the grant of a loan for the Yan Hee hydro-electric project in Thailand. The first phase of the scheme, consisting of basic hydro works with two 70 MW power units installed, is likely to cost the equivalent of $100 million with the distribution network accounting for another $30 million. The later stages of the scheme (further power units up to a total of eight with an output capacity of 560 MW) would cost up to a further $80 million. It is roughly estimated that the foreign exchange costs would be about two-thirds of the above. The International Bank is reported to be contemplating lending Thailand $66·5 million to be repaid over a 30-year period to finance the first stage of the project. The Thai Government, for their part, would be expected to set aside a total of $35 million from the national budget over the next five years.

On the assumption that the Yan Hee project will be proceeded with a decision has been taken to abandon the scheme for a 50 MW thermal power station at Nakorn Chaisri. To provide for increased electricity supplies until power is available from the Yan Hee project the United States I.C.A. aid authorities are considering making available interim assistance in the shape of a 10 MW thermal plant at Mae Moh in the north, and 10 MW of diesel-electric power in Bangkok itself. The latter is expected to be supplemented from local resources.

Further Railway Electrification in New South Wales

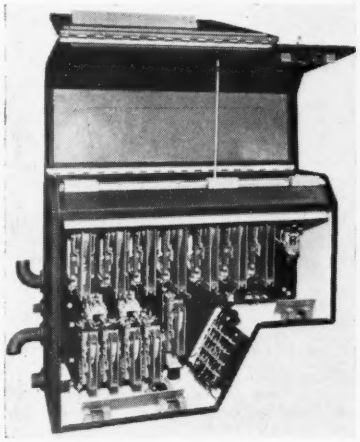
The Hornsby-Gosford railway line would be electrified before the South Coast line, the New South Wales Minister for Transport, Mr. A. G. Enticknap, announced recently. No date for the start of the electrification had been fixed, he said. For an outlay of £3,841,500 electrification of the Hornsby-Gosford line would save £720,000 a year on present operating costs. South Coast members of the State Parliament recently campaigned strongly for the South Coast line to receive priority.

New Glasgow Trolley-buses

THIRTY of the new trolley-buses now being placed in service by the Glasgow Corporation Transport Department have been supplied with traction equipment by the General Electric Co., Ltd. The scheme incorporates the company's patent "I.R. Control" system, which provides rheostatic braking with protection against overtorque and virtual independence of motor temperature, so that high braking efforts may be used safely in service. At the same time the braking effort is well maintained over a wide range of speeds. The buses are also equipped for automatic acceleration.

A single compound-wound motor of 125 h.p. is installed. While motoring, the separately-excited shunt field is connected through its discharge resistance across the main resistance, so that the effect of this field is reduced progressively as the main resistance is eliminated, and on completion of the resistance notching it is short-circuited. Six resistance notches are provided with the use of only five contactors by arranging for series-parallel connection of resistance sections on certain steps. Three weak-field notches are formed by two steps of field diversion and then by tapping one section of the series field.

All-metal contactor equipment case with covers open



Automatic control of acceleration is effected by an oil dashpot associated with the master controller, and under the influence of a relay carrying motor current. Since the master controller is connected to the pedal by a spring drive, it will only follow pedal movement if free to do so. The oil retarder has two valves, the main valve being controlled by the relay carrying motor current. So long as the motor current is below a predetermined value, the relay will drop and open the main valve, allowing the master controller to follow the pedal. Any rise in current will close the valve immediately and arrest the controller progression. To avoid stalling on hills or in other circumstances, the second valve associated with the oil retarder allows the master controller movement to follow that of the pedal at a slow rate, regardless of the current control of the main valve.

For rheostatic braking only a portion of the motor series field remains in circuit, and the regenerated current flows through it in the reverse direction to normal motoring. The shunt field is energised from the line in series with the armature. At high-speed braking the armature voltage exceeds line voltage and creates inverse excitation to limit the torque to a safe value. At low speeds the excitation is cumulative because the line voltage exceeds the armature voltage. The scheme in the new Glasgow buses incorporates the latest method developed by the G.E.C. for switching off the motor shunt field, which takes place at approximately ½ m.p.h.

One of the new Glasgow trolley-buses

The buses are equipped for battery manœuvring, this facility being obtained by means of a changeover switch. The battery is charged by an l.v. generator overhung on the motor.

Visible and audible warnings of dewirement are provided, a loss of supply causing two indicator lamps to be extinguished and a relay to be released which energises a buzzer from the l.v. circuits.

The butt contact master controller and the contactor equipment case are cab-mounted, the latter being of a new design. All-metal construction has been adopted for the contactor case, which has a double hinged cover arranged to fold back in two sections and to be held open by a strut in a convenient position for unobstructed access to the interior. Resilient mountings ensure freedom from shocks transmitted from the road wheels.

The trolley-bus chassis were made by British United Traction, and the bodies by Park Royal Vehicles.

Financial Section

STOCKS and SHARES

WEAKNESS of prices in the gilt-edged market has been for another week the outstanding feature in Stock Exchange markets. New low records were established by many Government stocks before signs of fresh resistance appeared. Responsibility for these conditions is still placed mainly upon the currency uncertainties which have been putting the pound under pressure, and upon the persistence of the trend towards inflation. As a hedge against the latter factor, industrials are proving something of a disappointment at present. In company reports the emphasis is mainly on the difficulty of maintaining adequate margins of profit against the continuous rise in production costs through wage increases.

Atomic Power Shares

Many of the shares of companies in the five main nuclear power development groups have lost a good deal of ground over the last month or two. During the past week General Electric Company slipped back to their lowest price of the year at 46s 3d. Associated Electrical Industries are in the same position at 60s. Yields on these shares are now respectively 5·4 and 5 per cent. Parsons and Reyrolle still show good net appreciation over the year, but stand some way below the best. English Electric and Crompton Parkinson have maintained their value relatively well. Heavy engineering shares in the atomic groups have lost fairly substantial proportions of their big earlier gains. Clarke Chapman at 162s 6d, for instance, are some 17s 6d under the best, although still 37s 6d above the year's low point. Head Wrightson at 133s 9d are 12s 6d below the top and 21s 3d above the lowest prices of this year, while International Combustion at 25s 6d and Simon-Carves at 31s 3d are about mid-way between the two extremes.

Ward & Goldstone

The £1 shares of Ward & Goldstone are now quoted ex- the 100 per cent scrip issue distributed to shareholders, in the form of "A" (non-voting) shares, through the capitalisation of £346,000 reserves. This is the second operation of the kind in three years, a fact demonstrating the scale on which reserves have been built up through the consistent retention of the major part of each year's profits for the development of the business. At last week's annual meeting Mr. S. Goldstone gave that policy as being mainly responsible for the size and modernity of the company's plant, and for the satisfactory results which he was again able to put before shareholders. Profits for the year ended in March increased from £391,000 to £439,000 (after tax of £432,000), and while the rate of the dividend was raised from 35 to 40 per cent, this left more than four-fifths of the surplus to be ploughed back.

Shares on Offer

Electrical shares recently on offer in fair numbers have included A. H.

Price Changes in

Company or Board	Nom. Value	Middle price 26th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1957 Highest	1957 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71⅛	−1	3	3	4 4 0	80	71⅛
Brit. Elec. 1974/77	100	68⅜		3	3	4 7 6	78⅛	68⅜
Brit. Elec. 1976/79	100	72⅜	−1	3⅛	3⅛	4 16 6	81⅛	72⅛
Brit. Elec. 1974/79	100	82½x.d.	−1	4⅛	4⅛	5 3 0	92⅛	82⅛
Overseas Electric Supply								
Calcutta Elec.	£1	16/3		6†	6†	7 7 9†	19/-	15/-
East African Power	£1	20/6x.d.	+6d	7	7½	7 6 3	21/-	19/-
Nigerian Elec.	£1	17/6x.d.		10	10	11 8 6	18/6	17/3
Perak Hydro-Elec.	£1	17/6		10	10*	11 8 6	18/-	13/3
Electrical Shares								
Aberdare Cables	5/-	12/6		17½	17½	7 0 0	12/6	9/9
Aerialite	1/-	6/3	−3d	45	48	7 13 9	6/6	4/9
Allen, W. H.	£1	47/-		10	10	4 5 0	47/3	33/6
Anglo-Portuguese Tel.	£1	24/3		8	8	6 12 0	27/6	20/6
Aron Elec. Ord.	£1	58/9		15	15	5 2 3	60/-	53/6
Assd. Automation	10/-	22/-	−9d	5	7½	3 8 3	24/9	17/9
Assoc. Elec. Ord.	£1	60/-		15	15	5 0 0	73/-	60/-
Automatic Tel. & El.	£1	73/9	−3d	15	17	4 12 3	75/-	54/6
Babcock & Wilcox	£1	73/3		15	15	4 2 0	82/6	70/-
Bakelite	10/-	23/3		16	15	6 9 0	24/6	20/9
Baldwin, H. J.	2/-	4/6		20	20	8 17 9	5/-	3/10½
Berry's Electric	5/-	6/6		—	10	7 13 9	6/6	5/6
British Aluminium	£1	57/6	−1/3	12	12	4 3 3	71/3	57/6
Brit. Elec. Traction: Def. Ord. "A"	5/-	24/6	−6d	22½	25	5 2 0	25/-	17/-
B.I. Callender's	£1	48/9	−1/-	12½	12½	5 2 6	55/-	48/3
B.I. Callender's 6% Pref.	£1	20/6		6	6	5 17 0	21/9	19/6
British Tabulating	£1	51/3		9	9	3 10 3	56/3	42/-
British Thermostat	5/-	25/-		25	25	5 0 0	27/6	25/-
British Vac. Cleaner	5/-	6/-		15	10	8 6 9	8/-	6/-
Brook Motors	10/-	37/6		25	25	6 13 3	37/6	30/-
Brush Group	5/-	7/9		10	Nil	—	8/-	4/6
Bulgin, A. F.	1/-	5/-	+3d	50	40*	8 0 0	5/6	4/6
Burco Dean	5/-	13/-	−3d	22½	20	7 13 9	14/-	8/9
Cable & Wireless: Ord.	5/-	12/6		10	10	4 0 0	12/6	9/6
4% Loan	100	90½		4	4	4 8 6	92½	89
Chloride El. Storage "A"	£1	66/3	+3d	17½	17½	5 5 9	68/9	58/-
Clarke Chapman	£1	162/6	−2/6	22½	27½	3 7 9	9	6½
Cole, E. K.	5/-	19/9	−1/-	17½	17½	4 8 6	23/6	16/6
Cossor, A. C.	5/-	6/9		15	Nil	Nil	7/3	5/9
Crabtree	10/-	25/-		20	20	8 0 0	26/-	23/3
Crompton Parkinson Ord.	5/-	16/6		16	16	4 17 0	17/9	14/6
De La Rue	5/-	24/6	+3d	30	35	7 2 9	24/9	16/3
Decca "A"	4/-	28/9	−6d	43½	43½	6 1 9	32/3	26/10½
Desoutter	5/-	35/6		30	32½	4 11 6	35/6	27/6
Dewhurst	2/-	7/9		30	16½*	4 3 9	7/9	5/9
Dictograph Tel.	2/-	5/9		20	20	—	6/3	5/9
Dubilier Condenser	1/-	6/3		30	30	4 16 0	7/6	5/6
Duport	5/-	20/9	−3d	23	25	6 0 6	21/-	17/6
E.M.I.	10/-	34/-	−1/-	15	15	4 8 3	36/-	23/9
Electrical Components	5/-	8/-		25	12½*	7 16 3	8/-	6/6
Elec. Construction	£1	25/-		8½	8½	6 16 0	27/6	21/9
Elliott Bros.	5/-	28/9	−1/-	17½	20	3 9 6	33/6	26/3
Enfield Cable Ord.	£1	15/6	−1/-	Nil	Nil	Nil	21/6	13/-
English Electric	£1	60/-x.d.	−6d	12½	14	4 13 3	65/-	47/6
English Electric 3½% Pref.	£1	12/-		3½	3½	6 5 0	14/3	13/-
Ericsson Tel.	5/-	47/6	−1/-	20†	22†	2 6 3†	50/-	33/3
Ever Ready	5/-	18/9		35	37½	5 0 0*	20/-	15/-
Falk Stadelmann	£1	38/3		17½	17½	9 3 0	40/6	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Hunt (Capacitors) 4s ordinary at 7s 4½d, showing a yield of 7½ per cent on the last dividend. Bowthorpe Holdings 2s shares have been available at 8s 1½d, at which price the yield is 4·6 per cent, assuming no change in the amount of the dividend following this year's share-for-share scrip issue. On a similar assumption, Electrical Apparatus 5s shares at 10s 3d offer a prospective return of 5½ per cent. A 5 per cent yield is shown on Colvern 5s shares at 18s 9d, and on Contactor Switchgear 5s shares at 13s 9d it is 6½ per cent. Among preference shares a line of Aerialite redeemable 6 per cents has been on offer at 18s 6d to yield 6½ per cent.

Electrical Investments

Company or Board	Nom. Value	Middle price 26th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1957 Highest	1957 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	46/3	−2/6	14	12½	5 8 0	58/9	46/3
G.E.C. 6½ Pref.	£1	20/6		6½	6½	6 6 9	23/6	20/6
General Cables	5/-	15/6		30	30	9 13 6	15/6	11/6
Greenwood & Batley	£1	47/6		17½	17½	7 7 3	47/6	45/3
Hackbridge Holdings	5/-	14/3x.d.	−6d	30	20	7 0 3	21/9	14/3
Hackbridge & Hewittic	5/-	13/9		23	20	7 5 6	16/-	13/6
Head Wrightson	£1	133/9	−1/3	20	22½	3 7 3	146/3	112/6
Heatrae	2/-	4/9		15	15	6 6 6	4/9	4/-
Henley's	10/-	14/9	+6d	11½	11½	7 16 0	17/-	14/3
Holophane	5/-	23/9		30	30	6 6 3	26/3	17/-
Hoover	5/-	37/6	−6d	50	50	6 13 3	44/-	24/9
I.C.I.	£1	41/9	−6d	10	10	4 15 9	46/6	37/9
Intl. Combustion	5/-	25/6		20	22½	4 8 3	30/-	20/-
Johnson & Phillips	£1	27/-		15	10	7 8 3	34/6	27/-
Lancashire Dynamo	£1	40/-x.d.	+6d	11	11	5 10 0	45/-	36/9
Laurence, Scott	5/-	17/9		15	15	4 4 6	19/9	13/9
Lister, R. A.	£1	30/-	−9d	10	10	6 13 3	33/9	26/9
London Elec. Wire	£1	48/3		12½	12½	5 3 9	53/9	43/-
Lucas, J.	£1	33/3		7½	7½	4 10 3	36/6	30/6
Marconi Marine	£1	36/6		10	10	5 9 6	37/-	31/-
Marryat & Scott	2/-	12/6		30	35	5 12 0	13/-	8/-
Mather & Platt	£1	58/9		15	15	5 2 3	63/9	51/3
Metal Industries	£1	27/-		Nil	9	6 13 3	30/-	20/3
Midland Elec. Mfg.	£1	52/6	+2/6	12½	12½	4 15 3	52/6	45/-
Morphy-Richards	4/-	17/6	+3d	50	50	4 11 6*	20/-	11/9
Murex	£1	71/3	−6d	20	20	5 12 3	79/6	65/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/1
Oldham & Son	1/-	2/9		17½	17½	6 7 3	2/9	2/3
Parnall (Yate)	5/-	7/-		12	12	8 11 6	8/9	5/9
Parsons, C. A.	£1	63/9		10	8½*	—	71/3	50/6
Plessey	10/-	72/6	+6d	27½	30	4 2 9	86/3	61/-
Pye "A" Deferred	5/-	16/3		12½	12½	3 17 0	20/-	15/9
Reyrolle	£1	96/-	−1/-	16½	17½	3 13 0	110/-	90/-
Rheostatic	4/-	9/-		18½	12½*	5 11 0	10/-	8/9
Richardsons Westgarth	5/-	17/9	−3d	16½	16½	4 14 0	20/-	17/-
Scottish Cables	4/-	17/9	−6d	27½	27½	6 4 0	19/3	15/-
Simon-Carves	5/-	31/3		28½	20*	3 4 0	36/3	26/-
Smith (England), S.	4/-	15/-		17½	17½	4 13 3	15/9	13/-
Southern Areas	£1	14/6		7½	7½	10 6 9	20/-	13/9
Strand Elec.	5/-	7/3		15	15	10 6 9	8/-	7/3
Sturtevant	5/-	23/3	+6d	15†	15†	3 4 6†	27/-	22/9
Sun Elec.	£1	43/9		20	25	11 8 6	43/9	43/9
Switchgear & Cowans	5/-	13/6		25	25	9 5 3	15/6	13/6
Taylor Tunnicliff	5/-	12/9	+6d	15	15	5 17 9	13/9	11/9
T.C.C.	10/-	41/3		25	25	6 1 3	41/3	35/-
T.C. & M.	£1	26/-		8½	8½	6 10 9	31/-	24/6
Telephone Mfg.	5/-	5/6		10	10	9 1 9	8/-	5/6
Telephone Rentals	5/-	11/6		12½	12½	5 8 9	12/6	10/3
Thompson (John)	5/-	32/6	−6d	25	25	3 17 0	37/-	29/3
Thorn Elec.	5/-	24/3x.d.		15	17½	3 12 3	26/3	16/3
Thornycroft	£1	25/-	−2/6	15	12½	10 0 0	37/6	25/-
Tube Investments	£1	65/-	−9d	22½	15*‡	4 12 3	68/9	58/3
Vactric	5/-	20/-		17½	25	6 5 0	23/9	12/9
Veritys	5/-	9/-		12½	12½	6 19 0	9/3	8/-
Walsall Conduits	4/-	13/3		20	20	6 0 9	15/-	11/-
Ward & Goldstone	5/-	29/-x.d.	+9d	35	40	3 9 0	29/-	18/6
Watford	2/-	6/6		25	25	7 13 9	6/9	6/3
Westinghouse	£1	37/6		18	9‡	4 16 0	41/3	36/-
West, Allen	5/-	11/9	−3d	15	15	—	13/6	9/6
Wolf Electric	5/-	11/-		20	20	4 10 9*	13/9	8/9

Globe Telegraph and Trust

This concern's 5s ordinary shares, currently quoted at 12s 3d, have become popular among investors who like to cover a great deal of ground with moderate amounts of capital. The recently issued annual report shows that holders of the shares have an interest now in quoted securities to the market value (as at the end of June) of nearly £18½ million, as well as in unquoted investments worth several more millions. Nearly 95 per cent of them are in the form of ordinary shares, and the geographical distribution includes 57 per cent in Great Britain, 10 per cent in Canada and 16 per cent in the United States. Investment income of the Trust again exceeded a million last year, and the dividend was maintained at 10 per cent on ordinary capital increased to £6 million by a "rights" issue. There is a yield of a fraction over 4 per cent on the shares at their present price.

East African Power

A final dividend of 4½ per cent from the East African Power & Lighting Co. brings the total for 1956 to 7½ per cent. This breaks a line of 7 per cent distributions going back over two decades or more, payable on capital increased by a succession of issues on "rights" terms to shareholders. Earnings took another good step forward last year, assisted no doubt by the increase in tariffs introduced in Kenya during the period. At £684,000 the profit before tax is some 13 per cent above the previous figure. Regarding prospects, the last annual report emphasised the continuous growth in the demand for electricity in East Africa through new building activity and the development of secondary industries. After improving to 20s 6d ex-dividend, the 20s shares offer a yield of nearly 7½ per cent on the new rate of dividend.

Power Securities Issue

Dealings are in progress in the new £1 ordinary shares issued by Power Securities Corporation, which owns all the shares of Balfour Beatty & Co. and is associated in that and other ways with the development of the East African Power Co. In early transactions there was a premium of about 10s 3d on the price of 40s at which the shares are offered to present holders. To a buyer at the total price of 50s 3d (free of transfer stamp), there is a yield of 4·4 per cent, assuming the maintenance of the dividend at the rate of 11 per cent paid for 1956. Power Securities can show a record of substantial and almost uninterrupted expansion of earnings since the war, and have been able to make a 1 per cent addition to the rate of the ordinary dividend paid in each of the past five years.

REPORTS and DIVIDENDS

The Automatic Telephone & Electric Co., Ltd., is paying an interim dividend of 5 per cent on the ordinary capital as increased by a one-for-three "rights" issue and by the issue of £150,000 in respect of an acquisition. Last year's interim dividend was 3 per cent. It is stated that the increased rate is to bring the interim and final payments into closer relationship and does not indicate a higher total distribution for the year.

East African Power & Lighting Co., Ltd.—The final ordinary dividend of 4½ per cent announced makes 7½ per cent for 1956 (against 7 per cent for 1955). Group profits advanced to £684,092 from £603,595 before charging £60,458 (£51,420) for tax, leaving a net balance of £623,634 (£552,175). The carry-forward is increased from £211,305 to £214,696.

George H. Scholes & Co., Ltd., report a net profit (after taxation) of £100,510 for 1956-57, as compared with £101,233 for the preceding year. A final dividend of 17½ per cent maintains the year's distribution at 25 per cent.

Power Securities Corporation, Ltd.—Shareholders are being offered 250,000 £1 ordinary shares at 40s each in the proportion of one for each six at present held.

Glenfield & Kennedy, Ltd., are offering preference and ordinary shareholders £1,600,000 5¾ per cent convertible unsecured loan stock, 1977-82, at £97 per cent. The stock is convertible at the rate of 25 £1 ordinary shares per £100 at 1st October, 1960, 1961 and 1962.

The Calcutta Electric Supply Corporation, Ltd., has declared a final dividend of 2½ per cent, making 8½ per cent free of tax for the fifteen months to 31st March last. For 1955 a total of 6 per cent tax free was paid.

Cape Electric Tramways (1949), Ltd.—The dividend for the year ended 30th June last is 6½ per cent against 6 per cent for 1955-56 when a bonus of 2 per cent was also distributed.

Calcutta Tramways, Ltd., is again paying an interim dividend of 5 per cent free of tax.

The Rheostatic Co., Ltd., is maintaining its interim dividend at 5 per cent.

New Companies

Thermaglow, Ltd.—Registered 7th August. Capital £5,000. Designers, manufacturers of and dealers in electrical heater elements, and heating apparatus, etc. Directors: A. H. H. Behm, C. H. Elliott and K. H. Temple. Secretary: Audrey J. Behm. Regd. office: Ocean Estates, Winterton-on-Sea, Norfolk.

Rogers & Taylor, Ltd.—Registered 1st August. Capital £15,000. Radio and television, sound acoustic, electrical and electronic engineers, etc. Directors: P. T. J. Taylor, F. J. Rogers, Mrs. Edith M. Taylor and L. G. Pilcher. Regd. office: 102, High Street, Ramsgate, Kent.

Sam Riley (Blackheath), Ltd.—Registered 1st July. Capital £5,000. Electrical engineers, etc. Directors: S. Riley and Mrs. Edna M. Tolley. Regd. office: Kings Theatre Buildings, Long Lane, Blackheath, Birmingham.

Layton Randall Engineers, Ltd.—Registered 2nd May. Capital £100. Electricians, mechanical and electrical engineers, etc. Solicitors: Carr & Co., 58, Jermyn Street, London, S.W.1.

Stelton Electrics, Ltd.—Registered 4th April. Capital £100. To instal, develop and operate radio and television relay equipment and refrigeration plant, etc. Directors: G. Dutton and Mrs. Phyllis M. Dutton. Regd. office: 134a, Wellington Road, Handsworth, Birmingham.

R. A. Electrical Co., Ltd.—Registered 9th May. Capital £100. Electrical engineers and contractors, etc. Directors: T. A. Reed, Mrs. Phyllis V. N. Reed, W. Armitage and Mrs. Edith E. Armitage. Regd. office: Sayes Street, Windmill Lane, S.E.8.

Broadwater Electrical & Radio, Ltd.—Registered 1st July. Capital £1,000. Retailers of, agents for and manufacturers of and dealers in electrical goods, equipment and apparatus of all kinds, radio and television sets, etc. Directors: F. Austwick and S. J. W. Holt. Regd. office: 77, Portland Place, W.1.

R. B. Holman & Co. (Plymstock), Ltd.—Registered 1st July. Capital £10,000. Wholesalers, retailers and distributors of electrical, radio and television equipment, etc. Regd. office: 35, Fore Street, Totnes, Devon.

Anglo American Electronics, Ltd.—Registered 1st July. Capital £100. Manufacturers of and dealers in electrical and electronic equipment, etc. Dr. D. B. Doran is the first director. Regd. office: 46, Windmill Street, Gravesend, Kent.

Brow Electrical, Ltd.—Registered 11th June. Capital £100. Manufacturers and designers of automatic control equipment, etc. Directors: A. Brown, L. Jackson and G. R. H. Kendrew. Regd. office: 63, Easy Road, Leeds, 9.

Semimetals, Ltd.—Registered 5th June. Capital £100. Manufacturers of and dealers in all kinds of semi-conductors, including rectifiers, transistors, photo-transistors and diodes, etc. Directors: A. G. Clark and A. E. Underwood (directors of the Plessey Company, Ltd., etc.). Regd. office: 56, Vicarage Lane, Ilford.

Central Electrics (London), Ltd.—Registered 15th May. Capital £100. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: J. Nunes and D. D. Parnell. Regd. office: 207, Brondesbury Park, N.W.2.

Electro Aid, Ltd.—Registered 18th July. Capital £2,200. Researches, investigations and experimental work in relation to the use of electrical and electronic aids in medicine, etc. Directors: Mrs. Thelma Hartman and J. Hartman. Solicitors: Bobbett Bros., Bristol.

Electro Driers, Ltd.—Registered 18th July. Capital £500. Manufacturers of and dealers in electrical goods of all kinds, etc. Directors: J. B. Longhorn and Pauline M. Pangburn. Regd. office: Bridge Works, New Road, Lymm, Ches.

Gladstone Law (Electric), Ltd. Registered 8th August. Capital £2,000. To acquire the business of electrical and general engineers, dealers in and repairers of and agents for all electrical appliances, television, radio, mechanical toys, etc., carried on by Gladstone Law at 80, Knowle Road, Mirfield. Directors: G. Law and Vera Law. Secretary: J. Kirkman. Regd. office: 80, Knowle Road, Mirfield, Yorks.

R.G. Components, Ltd.—Registered 24th May. Capital £100. Manufacturers of and dealers in electro-motive components, electronic and electrical plant, etc. Directors: G. Wilson and R. Whittaker. Regd. office: 22, Mincing Lane, Blackburn.

Surplices (Maidenhead), Ltd.—Registered 24th June. Capital £100. Electrical engineers, general electrical and refrigeration installation contractors, manufacturers of and dealers in wireless and television sets, etc. Directors: R. H. Tozer and Nora G. Tozer. Regd. office: 25-7, Oxford Road, Windsor.

F. A. Taylor and Co., Ltd.—Registered 23rd July. Capital £5,000. To acquire the business of electrical engineers and electricians carried on by F. A. Taylor and D. L. Clinch at 35, Little Roke Avenue, Kenley, Surrey, etc. Regd. office: Standard House, 52-54, Gray's Inn Road, W.C.1.

W. Warburton & Co., Ltd.—Registered 22nd July. Capital £8,000. Electrical engineers, etc. Directors: A. Hargreaves, K. Hargreaves and J. R. Hargreaves. Regd. office: Turbine Works, Bedford Street North, Halifax.

Stanley W. Hart & Co., Ltd.—Registered 18th July. Capital £500. Manufacturers of and distributors of and dealers in electrical goods of all kinds, radio and television sets, etc. Directors: S. W. Hart and B. S. Batt. Regd. office: 98a, Wellington Way, Bow, E.3.

Termination Equipment Co., Ltd.—Registered 25th July. Capital £1,000. Electrical, electronic, atomic, mechanical, motor and general engineers, etc. Directors: W. E. P. Lamplugh, Mrs. Diana Lamplugh and R. T. Rigley. Regd. office: Noel Works, Elson Street, Basford, Nottingham.

Radar Simulators, Ltd.—Registered 30th July. Capital £1,000. To develop, manufacture and sell radar simulators, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Increases of Capital

Fielden Research, Ltd.—Increased by £9,000, in £1 ordinary shares, beyond the registered capital of £1,000.

Howard Butler, Ltd.—Increased by £90,000, in £1 ordinary shares, beyond the registered capital of £10,000.

Anglo-Portuguese Telephone Co., Ltd.—Increased by £2,000,000, in £1 ordinary shares, beyond the registered capital of £5,100,000.

Bankruptcies

N. Sherman and **B. Bercovici,** lately trading together as "B.B. Radio and Television Service" and "B.B. Radio," at 168, Roman Road, London, E.2, radio, television and electrical equipment dealers.—Public examination, 25th October, at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. H. Pickwell, carrying on business under the style of J. H. Pickwell & Co. as a retailer of electrical goods and handicraft materials at 79, London Road, East Grinstead, Sussex, and as an electrical engineer and contractor at 108, London Road, East Grinstead.—Trustee, Mr. J. S. Bradley-Hole, 7, Old Steine, Brighton, 1, released 7th August.

H. C. Kinsley, 20, Waterloo Street, Market Rasen, Lincs., electrical engineer.—Receiving order made 14th August on a creditor's petition.

W. J. K. Incledon, 38, Primrose Drive, Huyton, Lancs., and lately carrying on business at 203, West Derby Road, Liverpool, electrical engineer.—Last day for receiving proofs for dividend 3rd September. Trustee, Mr. S. O. Henry (Parkin S. Booth & Co.), 5, Rumford Place, Liverpool, 3.

Liquidations

Rentalec, Ltd., dealers in electrical equipment, 36, Bruton Place, London, W.1.—Liquidator, Mr. F. M. Collins, Senior Official Receiver and Liquidator, Inveresk House, 346, Strand, London, W.C.2, released 25th July.

Vacuum Electrical Products, Ltd.—Winding up voluntarily. Liquidator, Mr. R. H. Darby, 54, Camp Hill, Birmingham, 12.

F. Hamilton & Co., Ltd., electrical engineers, Anderton House, Wharf Street, Stoke-on-Trent.—Winding up voluntarily. Liquidator, Mr. K. V. Longbottom, 1a, Queen Street, Burslem, Stoke-on-Trent, appointed by members on 10th August.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

THE distribution of elastic fluids (mainly air) in the branches of a main or central duct is an important problem occurring in various fields of engineering and probably most baffling in the case of large electrical machines, where the branches are the axial ventilation ducts in the iron. Two variants of the problem may be considered, viz. one in which both ducts and branchings are rough, and one with smooth ducts and rough branchings. The first is solved by formulæ with recurrent terms and subsequent integration, the second merely by formulæ with recurrent terms.

It is clear that the whole treatment of the problem is only a coarse approximating process by analogy with the much better founded methods of hydrodynamics, but then the state of the art in aerodynamics proper would not provide more rigorous methods. It is, above all, decisive that Reynolds' number for the flow through rough ducts or channels is so high that Atkinson's law $H = Q^2K$ mm w.g. (where H is the head, Q air volume and K the resistance) may be used. This enables an equation equivalent to Bernoulli's hydrodynamic equations, though with recurrent terms, to be written down, on which the calculation is based. The results show that under certain conditions oscillatory phenomena may occur, although the experimental investigations, while generally agreeing with the theoretical results, do not bear out this (extreme) case. However, these cases show where dangers of air pockets exist, which have to be guarded against (by altering the design) because they might result in hot spots on the machine.—" Branched Ducts, a Contribution to the Ventilation Problem of Turbo-Alternators," J. Hak, *E.u.M.*, Vol. 73, No. 15/16, pp. 373-379, No. 17, pp. 418-420, 1st August and 1st September, 1956, in German.

Shunting Circuit-Breakers

The generally recognised advantages of longitudinal compensation of transmission systems by series capacitors have to be bought by fairly heavy additional investments for these installations, particularly since capacitor switching under any possible conditions of system operation and also the special protection arrangements required, set problems of their own. It is therefore quite understandable that the general tendency will be to save on any element where this is possible and since the shunting circuit-breaker is normally only stressed by the voltage across the capacitors, representing a small percentage of the rated voltage, and in series with a surge divertor, this is clearly such a case.

The limits of the stresses across the breaker contacts will be the capacitor voltage on the lower and the breakdown voltage of the divertor on the higher side (in the concrete case discussed, the latter is 25-26 per cent of the system voltage). Furthermore, the breaking capacity required is relatively small and the insulation may also be of a lower class than that of other system elements; only the insulation *against earth* must be for the full operating voltage. It was found in a number of experiments that only certain types of small-rating breakers are suitable for this purpose, air-break switches being preferable to oil breakers, because re-ignitions in the latter may damage the contact system and de-ion grids owing to the slow opening rate of the contacts of some of the types tested. The author suggests special types of on-load isolators as particularly suitable.—" Conditions of Operation of Shunting Circuit-Breakers in Installations for Longitudinal Compensation," A. I. Kazachkov, F. I. Kurochkin and E. A. Marchenko, *Elekt. Stantsii*, No. 2, pp. 56-60, 1957, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Surges in Rotating Machines

When surge waves penetrate into a machine winding, the oscillations of the latter form a spectrum which is a combination of the natural frequencies of the winding; the highest of these, known as the limiting frequency, depends in some way on the eddy current losses in the stator and rotor iron. The limiting frequency has, among others, a flattening effect on the front of the surge wave, i.e. on the voltage gradient. Owing to the variable permeability of the iron, this effect will be different on the wave-front and tail, which renders the whole problem in its true form too complicated for analytical treatment.

When, however, the simplifying assumption is made of a constant permeability, the effect of the iron can be simply represented by a linear resistance shunted across the winding, and the various values of the permeability and their effects investigated separately by varying the values of the shunt-resistance. In this way a comparison of these effects with those of the main winding parameters (inductance, capacitance to earth and interturn capacitances) is possible and enables the order of magnitude of the limiting frequency to be assessed in these cases. The winding resistance can be neglected, as being much smaller than the equivalent resistance of the eddy currents in the iron. The differential equation of the winding obtained in this way, though of the fourth order, is of a well-known type, so that its solution does not represent a mathematical problem. It yields the natural frequencies, up to the limiting frequency.—" Effect of the Iron on the Limiting Frequency in the Windings of Rotating Electric Machines during Surges," V. Kreisinger, *Elektrotech. Obzor*, Vol. 46, No. 6, pp. 283-286, 1957, in Czech.

Welded Structural Details

THE Publications Department of the British Welding Research Association, 29, Park Crescent, London, W.1, has recently announced that a booklet which is one of a series on welding and associated processes, methods and design, is now available, price 7s 6d, post free. It is concerned mostly with structures designed by elastic methods of analysis although many of the details illustrated are suitable for structures designed by the " plastic theory." The relative advantages or limitations of typical details adopted in practice are discussed and the booklet acts as a guide to the selection of practical details and will assist designers and detail draughtsmen to combine simplicity with performance.

NEW PATENTS Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) will be obtainable after 4th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1953

33273. General Electric Co., Ltd., and Imm, R. C.—Devices for passing electric signals with time delay. 25th November, 1954. (782262.)

33403. Zahnradfabrik Friedrichshafen Akt.-Ges.—Measurement of electrical resistance. 1st December, 1953. (782091.)

34031. Ritz, H.—Current transformers. 7th December, 1953. (782264.)

34563. Cutler-Hammer, Inc.—Electric snap switches. 11th December, 1953. (Addition to 780972.) (782355.)

34743. Igranic Electric Co., Ltd.—Electric motor control systems. 14th December, 1953. (782109.)

1954

256. Morle, C. W. (Grigsby Allison Co., Inc.).—Electrical switches having wiping contacts. 5th January, 1954. (782110.)

2917, 3076 and 3077. Philips Electrical Industries, Ltd. — Electro-luminescent materials. 1st and 2nd February, 1954. (782095/7.)

6663. Eitel-McCullough, Inc.—Electron tubes. 8th March, 1954. (782100.)

7932. Edison Swan Electric Co., Ltd.—Socket holders for thermionic valves. 6th December, 1954. (782156.)

8628. British Thomson-Houston Co., Ltd. —Automatic control circuits for doors in underground mines. 18th March, 1955. (782112.)

9040. Telefunken Ges. — Discharge devices of the velocity modulated type. 29th March, 1954. (782157.)

9465. British Thomson-Houston Co., Ltd. —Fittings and circuit arrangements for electric discharge lamps. 31st March, 1954. (782113.)

9821. English Electric Co., Ltd.—Waveform shaping circuits and electronic phase-angle measuring apparatus. 1st April, 1955. (782266.)

11693. Pollak, H. O.—Tubular electrical contact devices. 29th March, 1955. (782160.)

12156. Pye Ltd.—Magnetic tape recording apparatus. 20th April, 1955. (782161.)

13397. Saunders-Roe, Ltd. — Direct coupled amplifiers. 8th June, 1955. (782268.)

20452. Westinghouse Brake & Signal Co., Ltd., and Martin, R. G.—Voltage regulators. 29th June, 1955. (782271.)

20681. Plessey Co., Ltd.—Electromagnetic vibrators. 13th October, 1955. (782171.)

21432. General Electric Co., Ltd., and Jenkins, G. H.—Electric switching arrangements. 22nd July, 1955. (782118.)

21622. Bonnella & Son, Ltd., D. H.—Electric tumbler switches. 25th July, 1955. (782174.)

22482. Metropolitan-Vickers Electrical Co., Ltd., and Bowen, J. H.—Electrical position follower systems. 25th July, 1955. (782272.)

27506. Henry & Thomas, Ltd., and Hutchins, R. S.—Multiple contact electric plug and socket members. 23rd September, 1955. (782103.) 27576. Electrical plug and socket connection. 23rd September, 1955. (782104.)

29649. General Electric Co., Ltd.—Protective earthing arrangements for electrical apparatus. 3rd October, 1955. (782119.)

30353. Hotpoint Electric Appliance Co., Ltd.—Electric heating appliances. 23rd September, 1955. (782276.)

30998. Bristol Co.—Electrical control system. 27th October, 1954. (782277.)

34224. General Electric Co., Ltd.—Manufacture of glass envelopes. 21st November, 1955. (782189.)

34298. Marconi's Wireless Telegraph Co., Ltd.—Variable inductance devices. 10th August, 1955. (782123.)

34546. British Thomson-Houston Co., Ltd.—Electric lighting fittings. 21st November, 1955. (782370.)

34969. British Thomson-Houston Co., Ltd.—Electronic computing arrangements. 30th November, 1955. (782433.)

36470. Jackson, R. A. F.—Electric space heaters. 24th November, 1955. (782127.)

36650. Jenaer Glaswerk Schott & Gen.—Electric melting furnaces. 17th December, 1954. (782128.)

36768. General Electric Co., Ltd., Puckette, C. C., and Kell, A.—Telephone instruments. 14th December, 1955. (782436.)

1955

431. General Electric Co.—Electrical apparatus. 6th January, 1955. (782130.)

1847. Ebauches Soc. Anon.—Electronic pulse generator. 21st January, 1955. (782283.)

2540. British Insulated Callender's Cables, Ltd.—Manufacture of electric cables. 26th January, 1956. (782442.)

2665. Lumitron, Ltd.—Reflectors for electric lamps. 5th December, 1955. (782198.)

2672. General Electric Co., Ltd.—Electric motor control systems. 2nd January, 1956. (782378.)

3402. Philips Electrical Industries, Ltd. —Apparatus for the automatic control of the temperature of a heating device. 4th February, 1955. (782285.)

3447. Centre National de la Recherche Scientifique.—Electrical spark machining devices. 4th February, 1955. (782443.)

3895. Metropolitan-Vickers Electrical Co., Ltd.—Dynamo-electric machines of the enclosed self-cooled type. 7th December, 1955. (782200.)

4243. Beresford & Son, Ltd., J.—Submersible electrically driven centrifugal pumps. 9th February, 1956. (782446.)

5219. Westinghouse Electric International Co.—Electron emissive coatings. 22nd February, 1955. (782287.)

6449. Standard Telephones & Cables, Ltd.—Glass-to-metal seals. 4th March, 1955. (782133.)

6661. Polytechnic Institute of Brooklyn.—Microwave power measuring systems. 7th March, 1955. (782450.)

7270. British Insulated Callender's Cables, Ltd.—Testing of electric insulated cables and wires and apparatus therefor. 11th March, 1955. (782290.)

7611. Crabtree & Co., Ltd., J. A., and Middleton, E.—Electric cartridge fuse holders. 17th February, 1956. (782207.)

8818. Siemens Bros. & Co., Ltd.—Telephone systems. 24th February, 1956. (782293.)

10127. Compagnie Générale de Télégraphie sans Fil.—Variable frequency reflex klystrons. 6th April, 1955. (782458.)

10649. Pofferi, G.—Apparatus for the electrical heat treatment of upholstery and other springs. 13th April, 1955. (782210.)

11097. Jackson, R. A. F.—Electric storage heaters. 19th January, 1956. (782137.)

11713. British Thomson-Houston Co., Ltd.—Voltage transformers. 6th April, 1956. (782299.)

12424. Marconi's Wireless Telegraph Co., Ltd.—Colour television apparatus. 30th January, 1956. (782461.)

13154. Chloride Electrical Storage Co., Ltd.—Lead-acid electric storage batteries. 23rd April, 1956. (782301.)

13365. Soc. des Bruleurs Thermex.—Apparatus for the heating of liquids electrically. 9th May, 1955. (782463.)

17468. Compagnie Générale de Télégraphie sans Fil.—Sintered cathodes. 16th June, 1955. (782138.) 17469. Sintered barium cathodes. 16th June, 1955. (782139.)

19119. Bochumer Verein für Gussstahl-Fabrikation Akt.-Ges.—Direct electrical resistance heating of metallic bodies. 1st July, 1955. (Addition to 778977.) (782468.)

20414. Accumulatoren-Fabrik Akt.-Ges. —Electric accumulators. 14th July, 1955. (782394.)

23723. General Electric Co.—Control arrangements for clothes dryers. 17 August, 1955. (782144.)

24724. Philips Electrical Industries, Ltd. —Apparatus for reproducing a series of signals. 29th August, 1955. (782319.) 25637. Interlocking of electric switching devices. 7th September, 1955. (782227.) 27079. Magnetic recording apparatus. 22nd September, 1955. (782230.) 29071. Magnetic tape recording reproducing heads. 12th October, 1955. (782327.)

29718. General Electric Co.—Electronic counting circuits. 18th October, 1955. (782233.)

30938. General Electric Co.—Temperature responsive control devices. 28th October, 1955. (782235.)

34165. Philips Electrical Industries, Ltd. —Carrier-wave telephony transmitters. 29th November, 1955. (782332.)

34269. Westinghouse Air Brake Co.—Electromagnetic relays. 30th November, 1955. (782404.) 35861. Electromagnetic delays. 14th December, 1955. (782405.)

36730. General Electric Co.—Electric current fuses. 22nd December, 1955. (782240.)

37334. Electricité de France.—Automatic, selective and cyclical devices for controlling the transfer of movement. 29th December, 1955. (782334.)

1956

393. Westinghouse Air Brake Co.—Mounting bases for electromagnetic relays of the plug-in type. 5th January, 1956. (782243.)

658. National Cash Register Co.—Bi-stable state transistor circuit arrangement. 9th January, 1956. (782406.)

2533. Kamm, L. J.—Electrical connectors and to electrical assemblies including the same. (782347.) 2534. Two-part electrical connectors. 26th June, 1953. (Divided out of 777446.) (782348.)

4641. Elektro-Mechanik Ges.—Inductive transmitters. 14th February, 1956. (782251.)

4742. Philips Electrical Industries, Ltd. —Circuit arrangements comprising a photo-transistor. 15th February, 1956. (782337.)

5845. Western Electric Co., Inc.—Automatic telephone answering systems. 24th February, 1956. (782384.)

6567. Babcock & Wilcox, Ltd.—Method of regulating superheat and reheat temperatures and improvements in or relating to vapour generating, superheating and reheating units. 2nd March, 1956. (782252.)

9498. Pirelli Soc. per Azioni.—Stop joints or terminals for multi-core h.v. electric cables. 27th March, 1956. (Addition to 752376.) (782256.)

9857. Eitel-McCullough, Inc.—Electron tubes. 8th March, 1954. (782101.) 9990. Electron tubes. 8th March, 1954. (Divided out of 782100.) (782102.)

11233. Siemens-Schuckertwerke Akt.-Ges. —Condenser excited asynchronous generators. 12th April, 1956. (782488.)

13443. Zahnradfabrik Friedrichshafen Akt.-Ges. — Electrical measurement of mechanical magnitudes. 23rd May, 1955. (Divided out of 782091.) (782092.)

13828. Standard Telephones & Cables, Ltd.—Data processing system. 4th May, 1956. (782408.)

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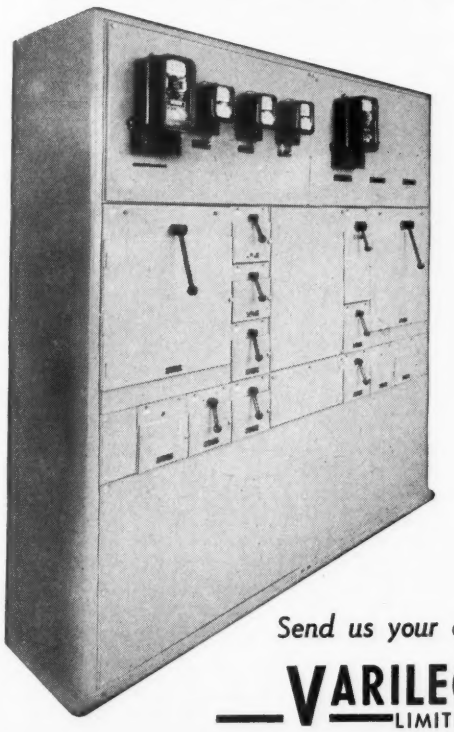

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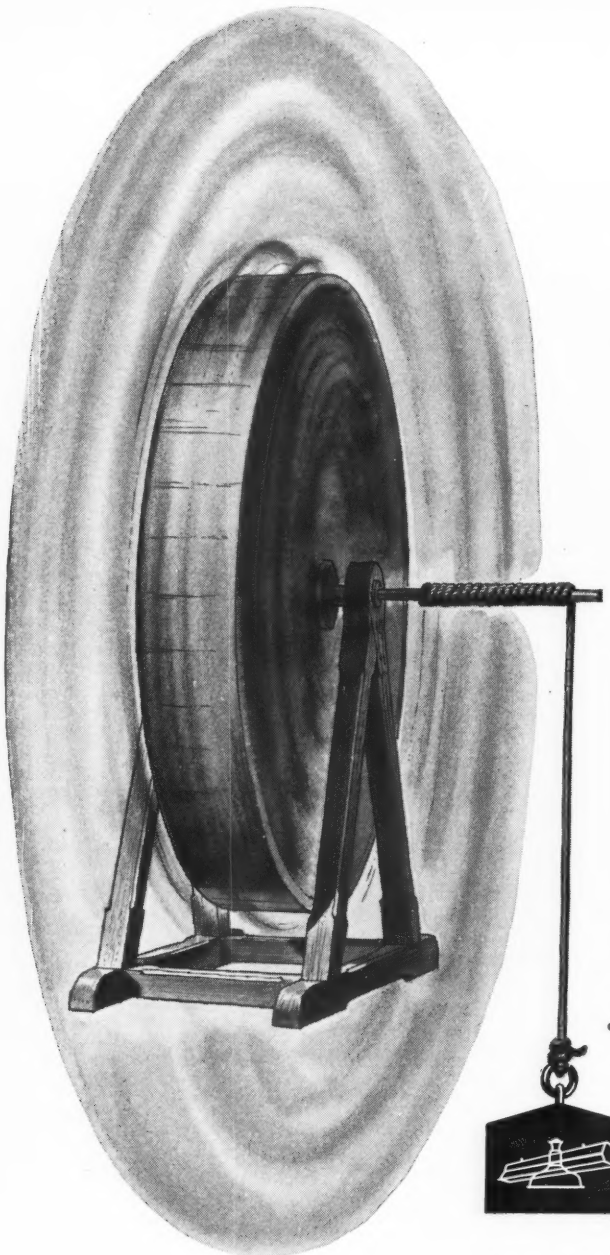

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In the 18th century
Johann Ernest Elias Bessier—
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for two months. On re-entry
the wheel was found, still spinning.
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caused Orffyreus to smash his invention
and he died in 1745, taking his secret
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Smees 109

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aldergrove (Co. Antrim).—6th September. Installation and completion of electrical work at new primary school. McLean & Forte, architects, 37, Malone Road, Belfast.

Australia.—Western Australian Government Tender Board, Perth. 5th September. 66 kV circuit-breakers. (E.S.B. 20183/57. Ten/27589.)*

P.M.G's Department, Melbourne. 24th September. Condensers. (E.S.B. 19880/57. Ten/27576.)*

N.S.W. Electricity Commission, Sydney. Power transformers. Closing date for receipt of tenders postponed to 9th September. (E.S.B. 14938/57. Ten/26475B.)*

Birkenhead.—Borough Council. 18th September. Renewal of the electrical installations at Market Hall. Borough architect, 3, Conway Street.

Brighton.—Waterworks Department. 14th September. Electro-mechanical equipment for remote indication and record of water level at three reservoirs. Waterworks engineer, 12, Bond Street.

Bristol.—Electric lamps, lamp shades, batteries and flashlamps for six months from 1st October. Central Purchasing Department, 2, Upper York Street, St. Pauls, Bristol, 2.

Cambodia.—Post and Telegraphs Department. Radio-telegraph transmitter, and miscellaneous radio material and spares. (E.S.B. 19154/57. Ten/27607.)*

Chile.—Public Health Department, Ministry of Public Works. 9th September. Two 1,500 kVA transformers. (E.S.B. 19736/57. Ten/27569.)*

Formosa.—Central Trust of China, Taipei. 10th September. Power and distribution transformers, control gear, circuit-breakers, switchgear, cables and fluorescent lighting equipment. (E.S.B. 19928/57.I.C.A. Ten/27558.)* 12th September. Welding and cutting equipment and portable electric tools. (E.S.B. 19929/57.I.C.A. Ten/27543.)*

India.—Damodar Purchase Corporation, Calcutta. 13th September. Distribution switchboards. (E.S.B. 20021/57. Ten/27532.)*

Stores Purchase Committee, Mysore. 16th September. 66 kV oil- or gas-filled cables. (E.S.B. 20069/57. Ten/27554.)*

India Store Department, London. Welding equipment. (See this issue.)

Malvern.—U.D.C. 9th September. Group "B" street lighting in Malvern Link. C. C. Judson, engineer, Council House.

New Zealand.—Dunedin City Corporation. 18th September. 33 kV and pilot cable, and joint and terminating boxes. (E.S.B. 20796/57. Ten/27667.)*

Redcar.—Borough Council. 13th September. Provision and erection of 63 group "A" street lighting units and 34 group "B" units. Borough engineer, Municipal Buildings, Ridley House.

Shrewsbury.—Borough Council. 5th September. Electrically operated pumping equipment. Borough engineer, Guildhall.

South Africa.—Railway Stores Department, Johannesburg. 11th September. Telegraph line material. (E.S.B. 19768/57. Ten/27541.)* 18th September. Electric lamps. (E.S.B. 20224/57. Ten/27565.)* H.v. switchboard. (E.S.B. 20225/57. Ten/27567.)*

Johannesburg City Council. 12th September. Passenger lifts. (E.S.B. 19686/57. Ten/27548.)*

Pretoria City Council. Trolley-buses. Closing date for the receipt of tenders postponed to 8th October. (E.S.B. 18868/57. Ten/27314A.)*

Spain.—Empresa Nacional de Electricidad, S.A., Madrid. 12th September. Electrical equipment, including aluminium steel cable and remote control, telesignalling and telemeasuring equipment and protective gear. (E.S.B. 20429/57.I.C.A. Ten/27611.)*

Electra de Viesgo, S.A., Madrid. 19th September. Control gear, circuit-breakers and switchgear. (E.S.B. 20194/57.I.C.A. Ten/27591.)*

Stevenage. — U.D.C. 16th September. Electrical rewiring of 56 houses, Whitesmead Road, Scheme 3. Surveyor, 19, Orchard Road.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Cheltenham.—Housing Committee. Electrical installations in 57 dwellings, Arle and Hesters Way estate (£1,723).—M. B. Owen.

Edmonton.—Housing and Building Committee. Electrical installations in 23 dwellings at Folly Farm/Eastbourne (£1,007).—Holmes & Larkinson.

Gateshead.—Corporation. Installation of electricity at Hill Heads Secondary Modern School (£8,136).—Tanjon.

Lancashire.—Education Committee. Renewal of the electrical installation at Durnford Street Schools, Middleton (£3,834).—Brindle & Kirby.

London.—L.C.C. Renewal and improvement of the electrical installation at Robert Blair County Primary School, Islington (£5,778).—H. A. Lamb & Sons.

Plymouth.—City Council. Recommended. Electrical installation at Sutton High School (£1,357).—Devon Electric & General Services.

Southport.—Education Committee. Electrical installation at the new High School for Girls (£5,687).—Troughton & Young.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Bradford.—Junior and infants' schools at Tong (£103,140); W. Clifford Brown, city architect.

South Bradford secondary school; Scherrer & Hicks, architects, 19, Cavendish Square, London, W.1.

Brentwood.—Houses (465), Hutton estate; chief housing officer, East Ham Town Hall, London, E.6.

Brighton.—Garage and coach station, Camelford Street and Marine Parade; Aquarium Garage, Ltd., 26, Marine Parade.

Covered market between London Road, Francis Street and Ditchling Road and erection of old folks' home at Craven Vale; borough engineer and planning officer, 26/30, King's Road.

Cambridge. — Fire station, Parkside (£150,000); county architect, Shire Hall, Castle Hill, Cambridge.

Carlisle.—Municipal offices, council chamber and assembly hall (£616,000); C. B. Pearson & Son, architects, 24, Loxford Street, All Saints, Manchester.

Cheetham (Manchester). — Two-storey factory, Caernarvon Street/Lord Street/Whitfield Street site, for J. & M. Bartle, Ltd.; P. Cummings, architect, 16, Oxford Street, Manchester, 1.

Consett. — St. Patrick's R.C. Church (£40,000); John Cummings, builder, Matamba Terrace, Sunderland.

Cumberland.—Combined library and clinic at Seascale (£11,000); county architect, Portland Square, Carlisle.

Dagenham.—Factory and offices, Wantz Road; Lakeside Ironworks, Ltd., constructional plate workers, Dagenham.

Darlington. — New buildings, Memorial Hospital (£445,000); Newcastle Regional Hospital Board, Newcastle.

Derby.—Secondary modern school, Boulton Moor; borough architect.

Dundee.—New frontage building at Queen's College (£430,000); R. H. Matthew, architect, 31, Regent Terrace, Edinburgh.

Durham.—Fire station at Consett (£16,000); county architect, South Street, Durham.

Eston (Yorks).—Houses (112), Teesville East estate, for U.D.C.; N. C. Harrison, surveyor, 246, Normanby Road, South Bank-on-Tees.

Gateshead.—Chest clinic, Whinney House Hospital; P. H. Knighton, chief architect, Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Grantham.—Flats in Grange Gardens (£37,334); Unity Structures, Ltd., 35, Tavistock Square, London, W.C.1.

Harlow.—Factory; Smith's (Engineers), Ltd., Factory Way.

High Wycombe.—Houses (36), off Deeds Grove; General Housing Co., Ltd., 55, The Mall, London, W.5.

Huddersfield.—Aged persons' hostel, Farnside estate; borough architect.

Isle of Ely.—Fire station, Sutton; and new block at High School, March; county architect, March, Cambs.

King's Lynn.—Factory, Hardwick Road; Campbell's Soups, Ltd., 280, Euston Road, London, N.W.1.

Knaresborough.—Unity dwellings (100) and community block, Charlton Manor estate; U.D.C. surveyor, Knaresborough House.

Lancaster.—Extensions to Royal Grammar School (£10,000); C. B. Pearson & Sons, architects, 18, Dalton Square, Lancaster.

London.—Shops and offices, Old Street; John D. Morgan & Partners, architects, 6, Charterhouse Square, E.C.1.

Central library, Theobalds Road; borough architect, Holborn.

Dwellings (40), Hartington Road, Chiswick; M. Howard, Ltd., Wandle House, London Road, Mitcham.

Branch library on site of 24/30, Dalston Lane, Hackney (£35,700); town clerk, Town Hall, Hackney, E.8.

March.—Bungalows (22), Badgeney/Deerfield estate; U.D.C. architect, March, Cambs.

Merthyr Tydfil.—Bus station with block of offices and workshops (£100,000); borough engineer, Town Hall.

Middlesbrough.—Three- and four-storey flats in the East Street and Graham Street redevelopment areas; J. A. Kenyon, borough engineer.

Morpeth.—Rebuilding of the Comrades Club, Bells Yard (£23,000); R. W. Bell & Co., Ltd., Mistletoe Road, Newcastle-on-Tyne.

Northumberland.—New county offices; central stores at the police headquarters at Morpeth; fire stations at Seahouses and Belford and welfare home at Blyth; county architect (C. C. Brown), County Hall, Newcastle.

[*Continued on next page*

Nuneaton.—Factory; D. & R. Closers, Ltd., Avenue Road.

Ossett. — Dwellings (144), Broadowler estate; Gregory Construction, Ltd., 15, King Street, Huddersfield.

Peterborough.—First stage of new Glinton C.E. School for Soke of Peterborough Joint Education Board; Board's architect, Bridge Street.

Houses (60), on Paston/Gunthorpe estate; H. J. Firman, Ltd., Newark Road, Peterborough.

Plymouth.—Flats (24), High Street, Stonehouse; F. J. Stanbury, Ltd., builders, Alexandra Road.

Factory, Ernesettle; James Cook & Co. (Chard), Ltd., Snowden Works, Chard.

Poole.—Offices and stores; Whitelock & Co., Ltd., 218, Bournemouth Road, Branksome.

Ringwood.—Dwellings (56), Burton area; New Forest Construction Co., Ltd., Christchurch Road, New Milton.

Romford.—Operating theatre, Harold Wood Hospital; Thurgood, Son & Chidgey, surveyors, 2, Broad Street Buildings, London, E.C.2.

Shops and flats, High Street (£50,000); town clerk, Town Hall.

Rothbury.—R.C. church, High Street; W. Brown & Son, contractors, Thropton.

Rotherham.—Old Hall Secondary School, Kimberworth (£150,000); director of education, 21, Moorgate Road.

Scarborough.—Technical College; Gollins, Melvin, Ward & Partners, architects, 15, Manchester Square, London, W.1.

Shiremoor (Northumberland). — Proposed new church; G. E. Charlewood, architects, 14, Neville Street, Newcastle-on-Tyne.

Solihull (Birmingham). — Science laboratories at Solihull School (£25,000); Osborn & White, architects, 190, Broad Street, Birmingham, 15.

South Shields.—Factory for the Tyne Wire Rope Manufacturing Co., Ltd.; R. Collins, architect, St. Hilda Street.

Stanley (Co. Durham.)—Private housing estate at Burnopfield for W. Leech, Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne.

Stevenage.—Church of St. George for Diocese of St. Albans; Seely & Paget, architects, 41, Cloth Fair, London, E.C.1.

Stockton-on-Tees. — Proposed Roseworth Secondary Modern School (£177,000); G. Fordy & Son, builders, Boathouse Lane.

Swansea. — Chemistry, metallurgy and physics blocks for Technical College; borough architect.

Swindon.—Factory extension for Clover Leaf Products, Ltd.; Clark Bros., builders, Oxford Road.

Tickhill.—Houses (34), Sunderland Street; U.D.C. architect, Tickhill, Yorks.

Tunbridge Wells.—Development of premises in Grove Hill Road to form divisional offices (£34,203); E. T. Ashley Smith, county architect, Springfield, Maidstone.

Tynemouth.—Fire station; R. Jordan, builder, Back Queen Alexandra Road, North Shields.

Wakefield.—Flats (40), Clarion Street; W. D. des Forges, Town Clerk.

Wallingford.—Laundry for Fairmile Hospital; J. Roger Preston & Partners, consultants, 15, North Audley Street, London, W.1.

Wallsend.—Four blocks of three-storey flats in Ropery Lane; J. H. James, builder, Archer Street.

Watford.—Houses (28), Gills Hill Lane, Radlett; S. A. Nicholson, clerk to R.D.C., Wynyard House, Langley Road.

Welshpool. — Grammar and secondary modern school; T. Glyn Davies, director of education, Education Office, Newtown, Mont.

Whickham (Co. Durham).—Office block; U.D.C. surveyor.

Whittlesey. — Dwellings for old people, Wilderness site; Ruddle & Wilkinson, architects, Longcauseway, Peterborough.

Worthing.—Secondary modern school for boys (£148,104) to replace St. Andrew's C.E. school; town clerk, Town Hall.

Catalogues and Lists

AIR COMPRESSOR.—Leaflet describing the "Mini-Compressor" designed for paint spraying, car tyre inflation, spraying of insecticides, operating brazing torches, etc.—**Gennar Engineering, Ltd.,** 99, Old Street, London, E.C.1.

ALTERNATORS. — Folder (147) describing a range of alternators for providing 400 c/s and other high frequency supplies.—**Laurence, Scott & Electromotors, Ltd.,** Gothic Works, Norwich.

BOILER CONTROL EQUIPMENT.—Three leaflets (140, 141 and 142) dealing respectively with equipment for steam pressure reduction, de-superheating, and combined installations for pressure reduction and de-superheating.—**James Gordon & Co., Ltd.,** Dalston Gardens, Stanmore, Middlesex.

BUSHINGS.—Loose-leaf catalogue describing the "Ethox" range of bushings for switchgear and transformers, etc., moulded in epoxide resin.—**J. R. Ferguson (Electrical Engineers), Ltd.,** Tameside Works, Park Road, Dukinfield, Cheshire.

CABLE.—Illustrated descriptive brochure (ME/5) giving particulars of the company's helical membrane radio frequency cables.—**Telegraph Construction & Maintenance Co., Ltd.,** Mercury House, Theobald's Road, London, W.C.1.

CAPACITORS.—Leaflet (CL 560R) dealing with the "Therminol" capacitors for power factor improvement and leaflet (CL 561) covering oil-filled capacitors for street lighting installations.—**A. H. Hunt (Capacitors), Ltd.,** Wandsworth, London, S.W.18.

CATERING EQUIPMENT. — Leaflets (183 and 186) giving particulars of electrically heated fryers for counter or pedestal mounting and a price list (C/657) showing the latest figures for a range of electrical catering equipment.—**Electroway Heaters, Ltd.,** Loughborough, Leics.

DISTRIBUTION SYSTEMS.—38-page booklet entitled "An Outline of Electrical Distribution Systems," giving details on system design, choice of switchgear, the calculation of symmetrical short-circuits and particulars of basic distribution systems.—**English Electric Co., Ltd.,** East Lancashire Road, Liverpool, 10.

ELECTRIC CLOCKS.—24-page illustrated catalogue of "Gibson" clocks.—**Baume & Co., Ltd.,** Dunstan House, Cross Street, London, E.C.1.

MEASURING INSTRUMENTS. — Three descriptive leaflets (199, 159 and 190) dealing respectively with "Disc-Scale" moving coil ammeters, "Dwarf" ammeters and voltmeters and vibrating reed frequency meters.—**Everett Edgcumbe & Co., Ltd.,** Colindeep Lane, Hendon, London, N.W.9.

THERMOMETERS.—33-page technical publication (134) describing the company's range of electrical resistance thermometers.—**Foster Instrument Co., Ltd.,** Letchworth, Herts.

TRANSFORMERS.—Four leaflets dealing with standard transformers for fixed situations, air cooled semi-enclosed transformers and open type low voltage transformers, together with separate price lists.—**Foster Transformers, Ltd.,** South Wimbledon, S.W.19.

Series of leaflets on single- and three-phase open type, potted type and hermetically sealed transformers manufactured by the company.—**Standard Telephones & Cables, Ltd.,** Rectifier Division, Harlow, Essex.

VACUUM PUMPS.—24-page catalogue illustrating and describing the company's range of "Speedivac" rotary high vacuum pumps and series GKS and GKD vacuum pumps.—**Edwards High Vacuum, Ltd.,** Manor Royal, Crawley, Sussex.

WELDING.—Technical brochure entitled "How to Spot Weld Low Carbon Steel."—**Bates & Bates, Ltd.,** Blackburn Street, Garston, Liverpool, 19.

Leaflet giving information on the "Vick" bench type 4 kVA and 8 kVA spot welders.—**W. D. Vick, Ltd.,** 28, Station Road, Acocks Green, Birmingham, 27.

WIRING ACCESSORIES. — Numerical price list (HCP390) giving the latest figures for the company's range of wiring accessories.—**M. K. Electric, Ltd.,** Wakefield Street, Edmonton, London, N.18.

Wall chart giving prices, particulars and illustrations of the company's range of wiring accessories.—**E. F. Electric, Ltd.,** Willow Lane, Watford.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 7th September:—

BOSCH. No. B608,364. Class 9. Electric switches and parts, and electric switch boxes, all for use on vehicles. BOSCH. No. B608,365. Class 11. Electric lamps for vehicles.—Robert Bosch G.m.b.H., Stuttgart-W, Germany. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool, 1.

FIRETRON (design). No. 760,827. Class 9. Photoelectric cells.—Electronics Corporation of America, Cambridge, Mass., U.S.A. Address for service, c/o A. M. & Wm. Clark, Quality House, 5-9, Quality Court, Chancery Lane, London, W.C.2.

STANPART (design). No. 762,295. Class 9. Aerials, ammeters, electric batteries, junction boxes, electric cigar lighters, revolution counters and temperature indicators, etc., all for use in motor land vehicles; insulated wire, cable, coils, commutators, condensers, contacts, cut-outs, safety fuses (cut-outs), fuse wire, relays, resistances, switches, transformers, apparatus for use in the distribution of electric power; and electric foot warmers, fire extinguishers, radio sets and loudspeakers, etc.—Standard Motor Co., Ltd., Banner Lane, Coventry.

KOEROX. No. 763,996. Class 9. Electrical apparatus and instruments, and magnets.—Alfred Krupp Von Bohlen und Halbach, trading as Fried. Krupp in Essen, Essen, Germany. Address for service, c/o Brewer & Son, Quality House, 5-9, Quality Court, Chancery Lane, London, W.C.2.

POLYSOL. No. B764,953. Class 9. Aerials for radio telephony, for telegraphy and for television; and electric flexibles, insulated wire, insulated cables for electric transmission systems and electric conductors.—Concordia Electric Wire & Cable Co., Ltd., Trent Mills, Derwent Street, Long Eaton, near Nottingham.

PALABA. No. 765,119. Class 9. Electric batteries; and cases for electric pocket lamps. PALABA. No. 765,120. Class 11. Electric torches.—Bateria Slany, Narodni Podnik, Slany, Czechoslovakia. Address for service, c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

UNIFLEX. No. B765,121. Class 9. Insulated cables used in welding.—British Federal Welder & Machine Co., Ltd., Castle Mill Works, Dudley, Worcs.

ETEL. No. 765,974. Class 9. Electric discharge tubes (not for lighting purposes).—Electronic Tubes, Ltd., Kingsmead Works, Fassetts Road, Loudwater, High Wycombe, Bucks.

MANDAW MASTERBEAM. No. 759,902. Class 11. Torches; and electric lamps and lamp bulbs.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

INFRA-MATIC. No. 765,446. Class 11. Infra-red cooking apparatus.—I.C.G., Ltd., 4, Lloyds Avenue, London, E.C.3.

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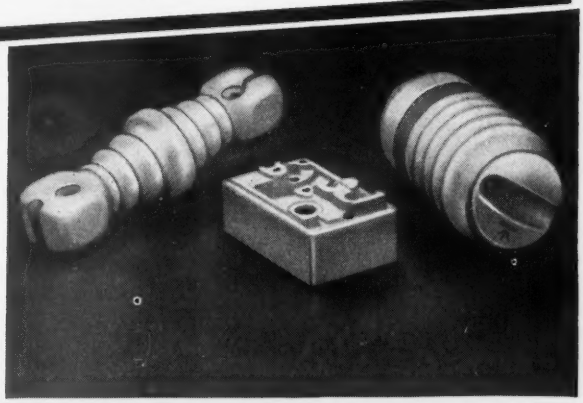

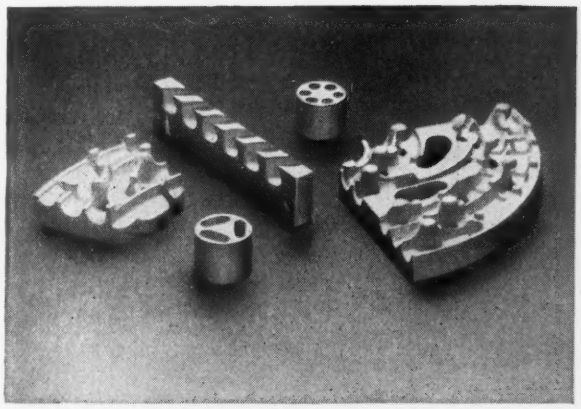

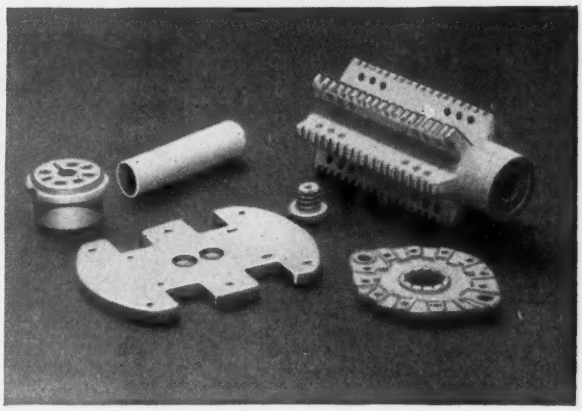

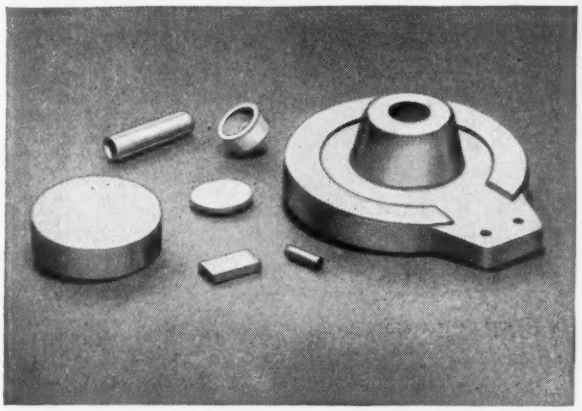

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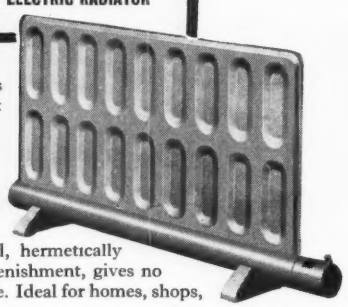

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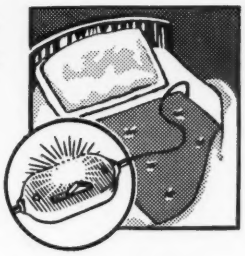

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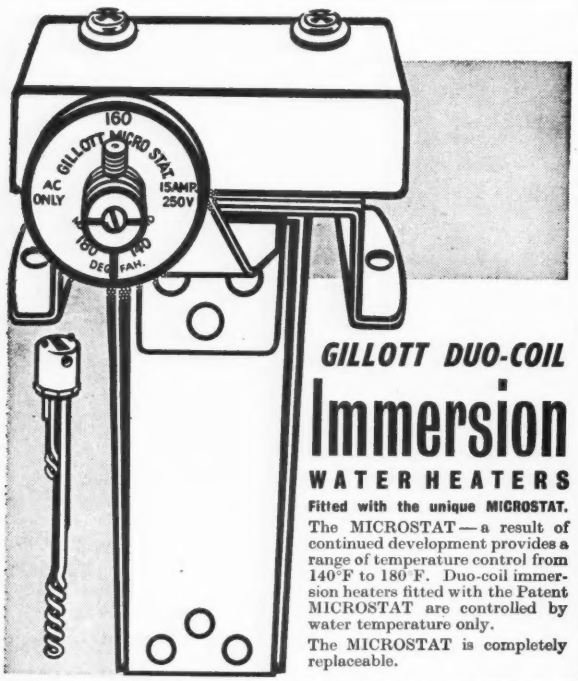

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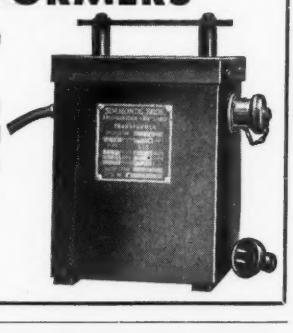

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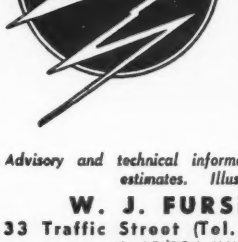

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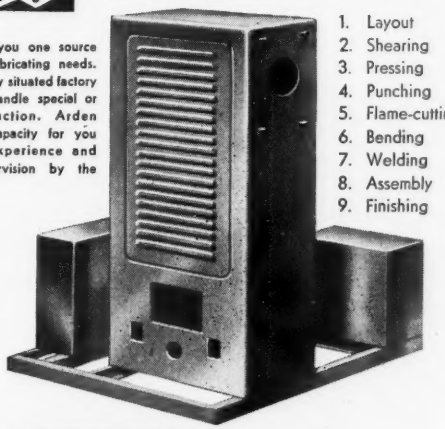

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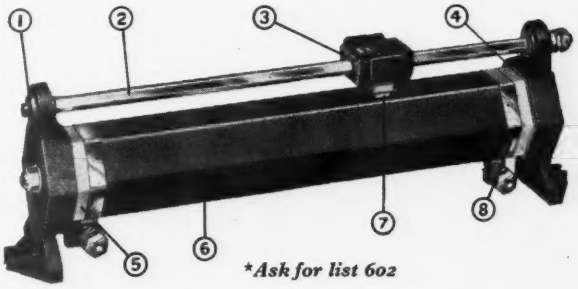

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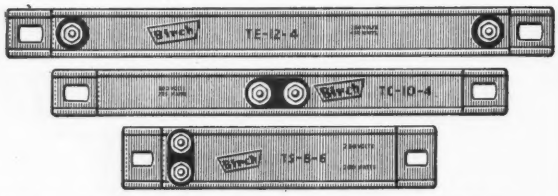

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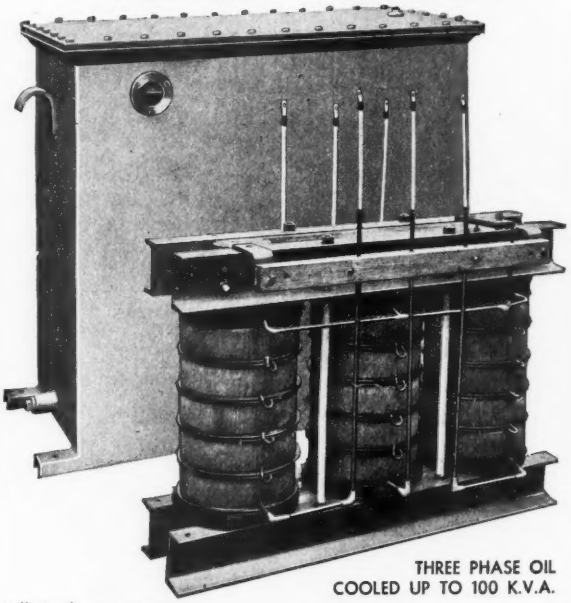

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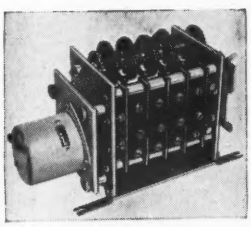

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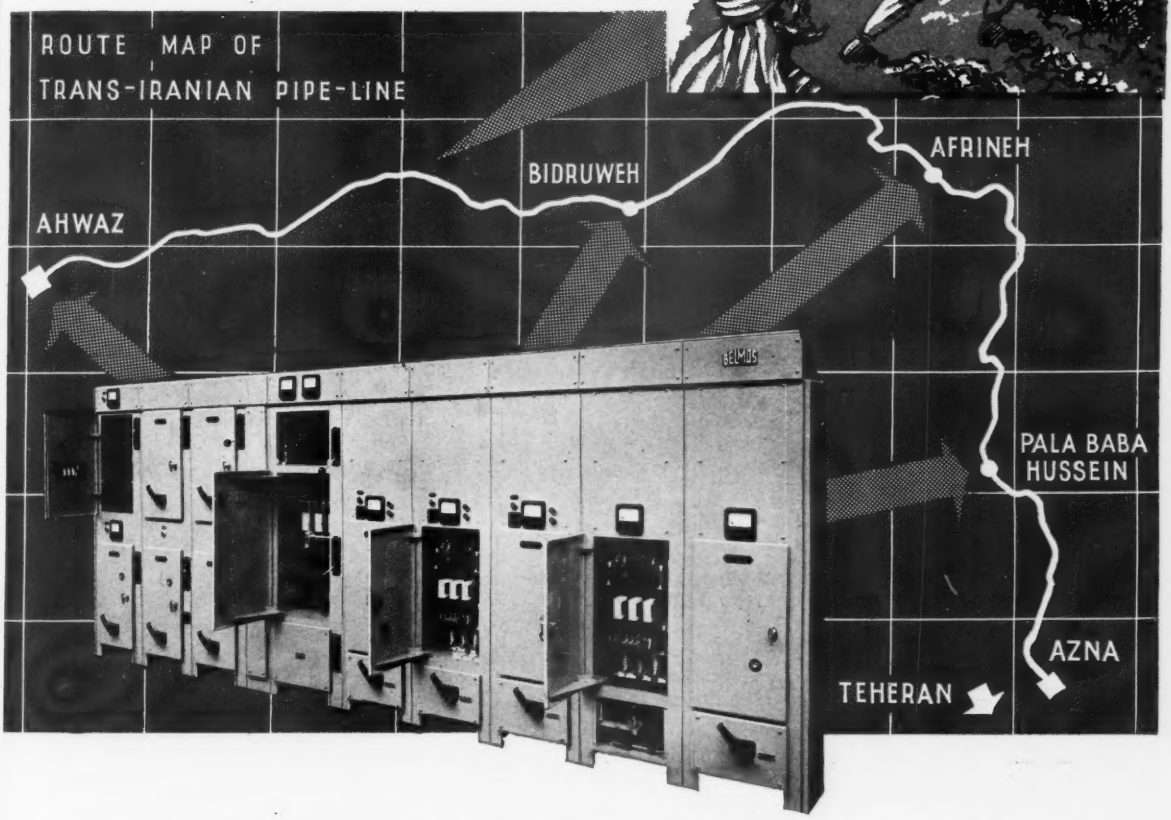

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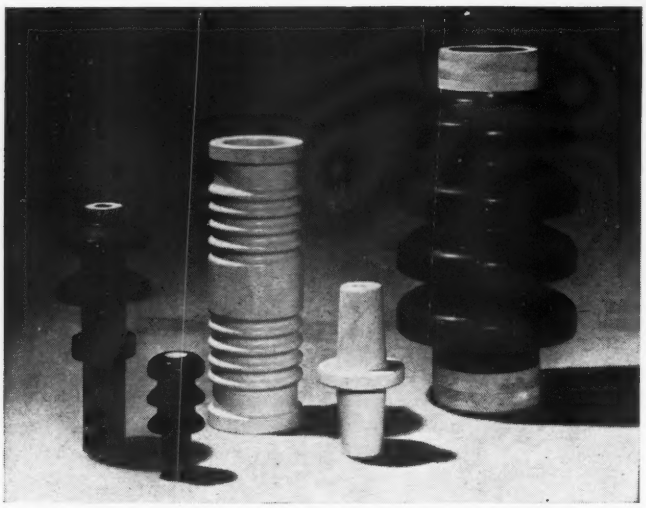

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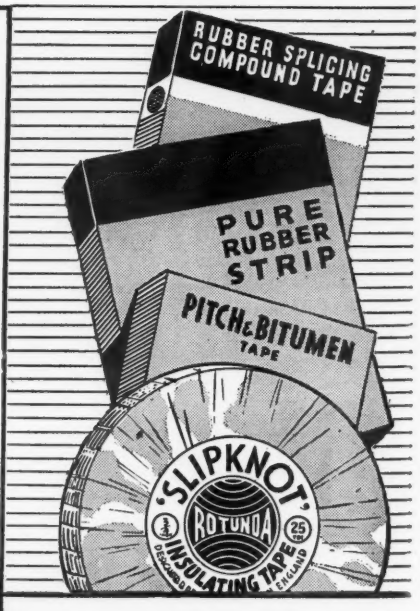

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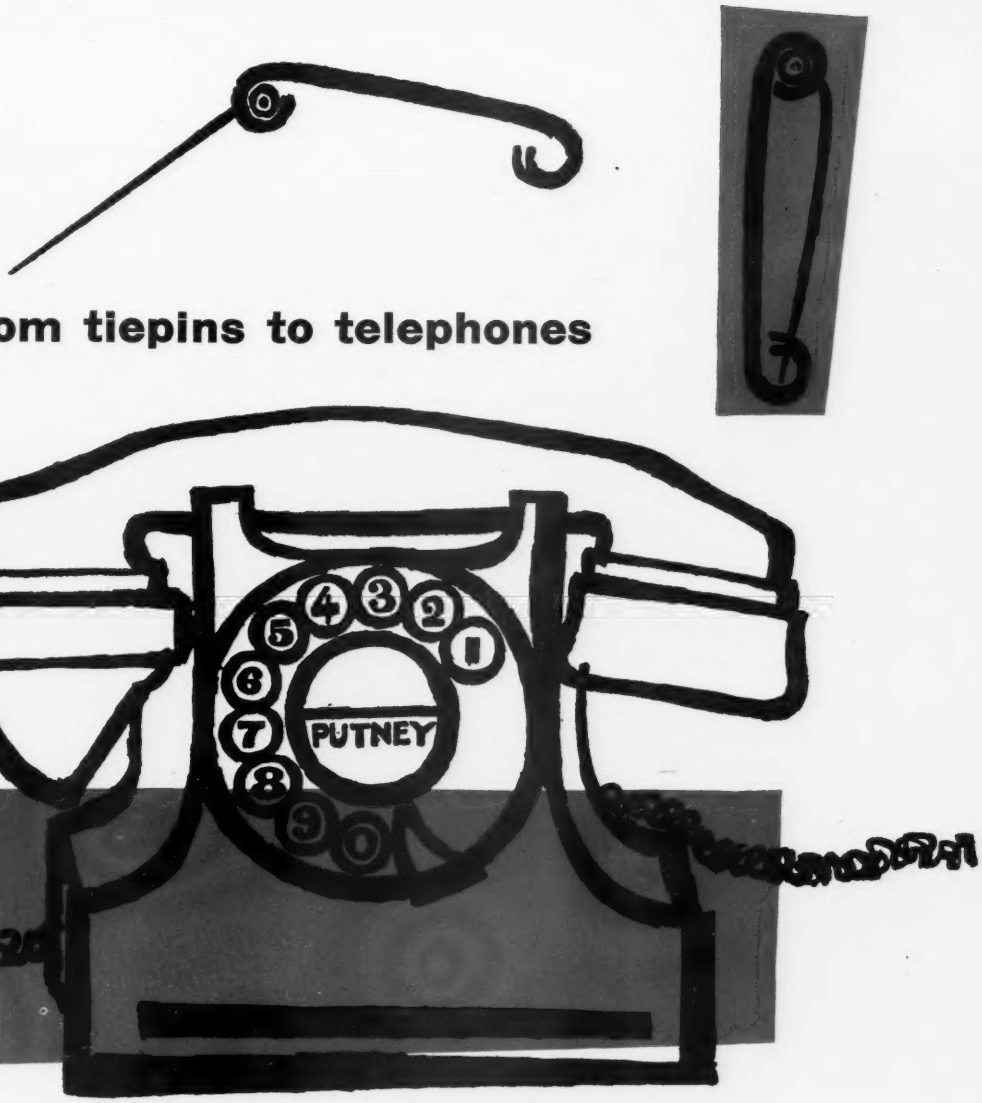

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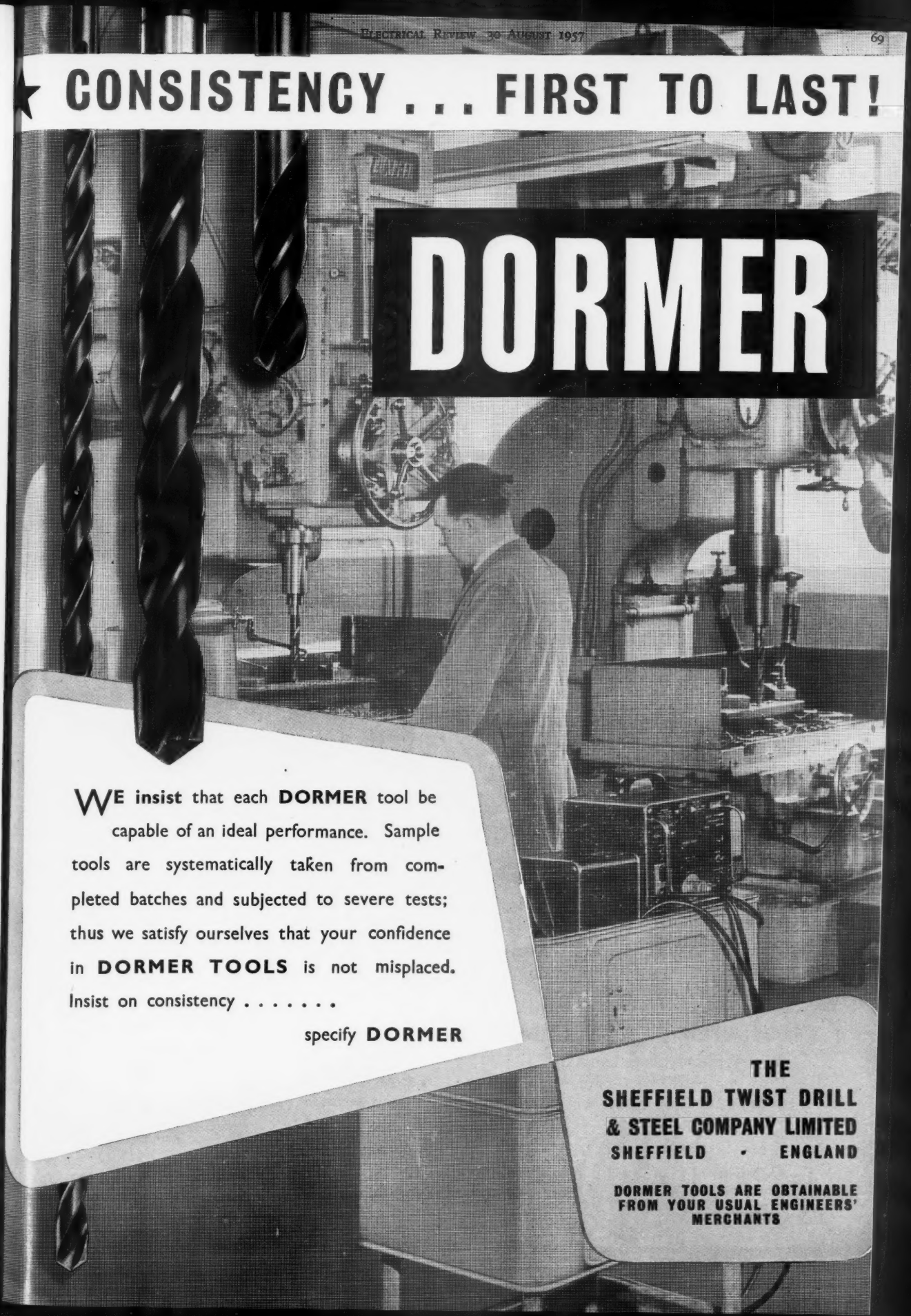

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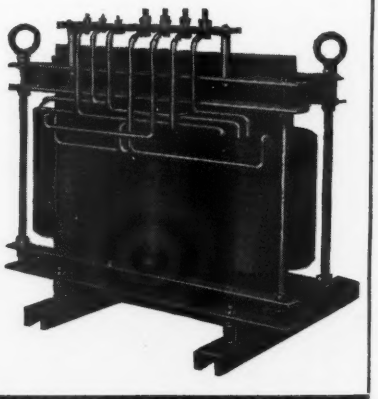

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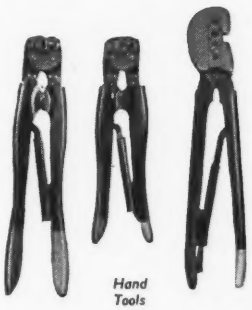

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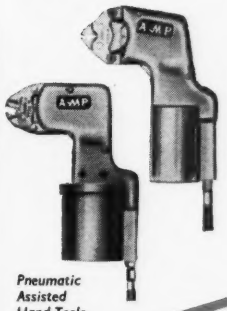

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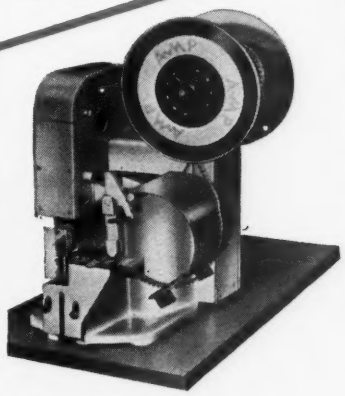

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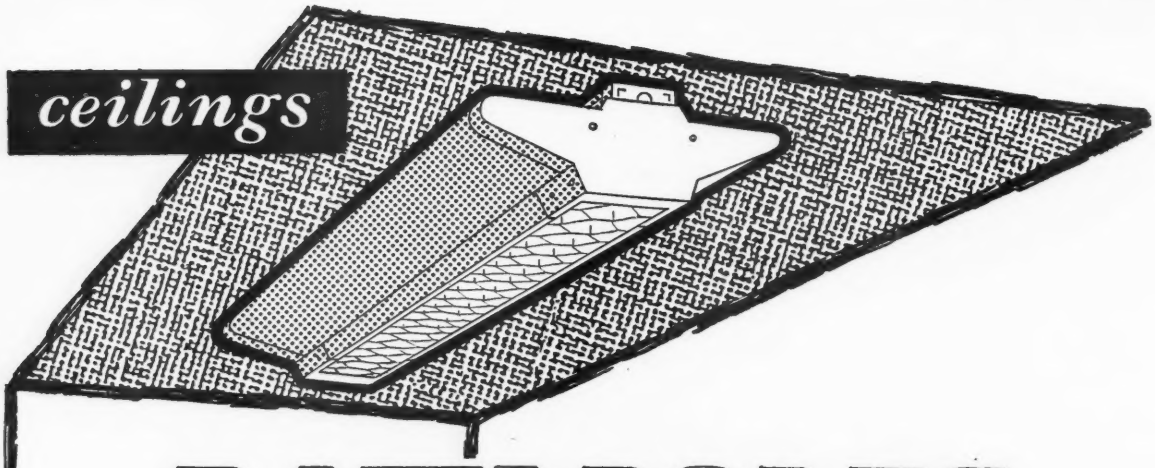

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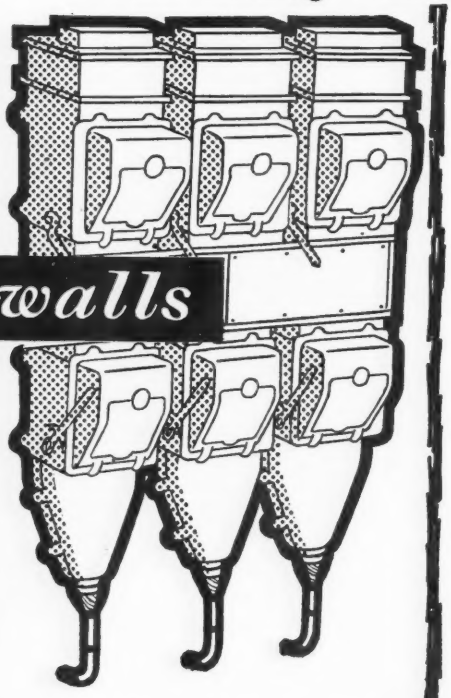

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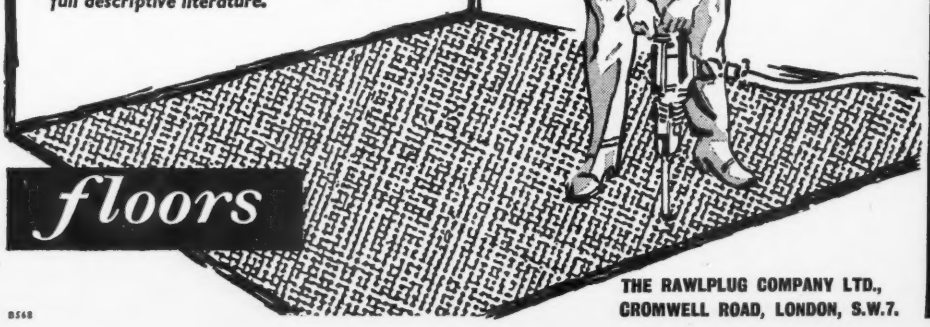

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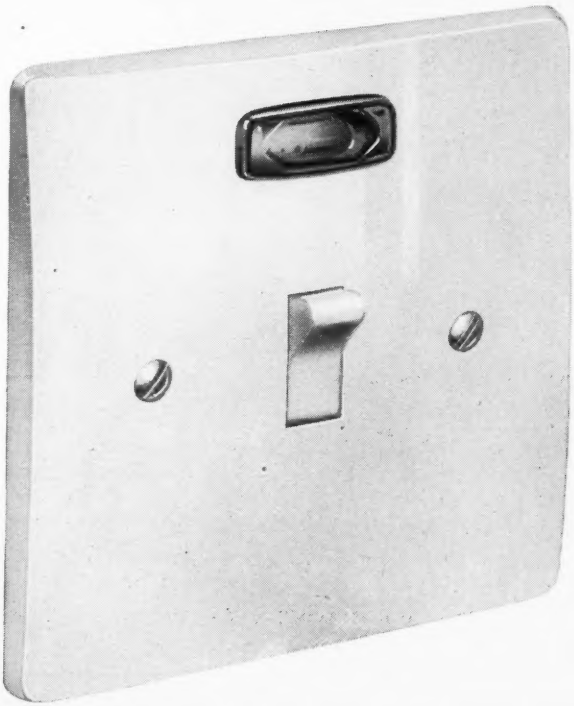
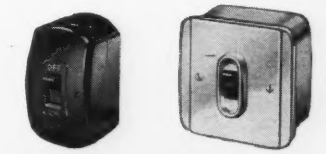


HERE is a *complete* new range of 20 ampere switches consisting of flush and surface patterns with or without pilot-lamps. The flush units have insulated plates moulded in brown or ivory, or brass plates finished BMA or matt chrome. The surface units are either all-insulated moulded in brown or ivory, or metalclad with steel box and cover plate finished aluminium stove enamel. The new switches are particularly suitable for water heater control, and any pattern can be supplied marked "WATER HEATER". Special features of the range are compactness and neat appearance. Ease of fixing and wiring has been carefully studied. The surface insulated patterns have self-contained mounting blocks and are ready to fix straight to the wall. All patterns have good earthing facilities. Write to-day for leaflet 243 which describes these attractive new switches in full.



List No. 5202

List No. 5212

List No. 5203

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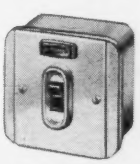
List No. 5222



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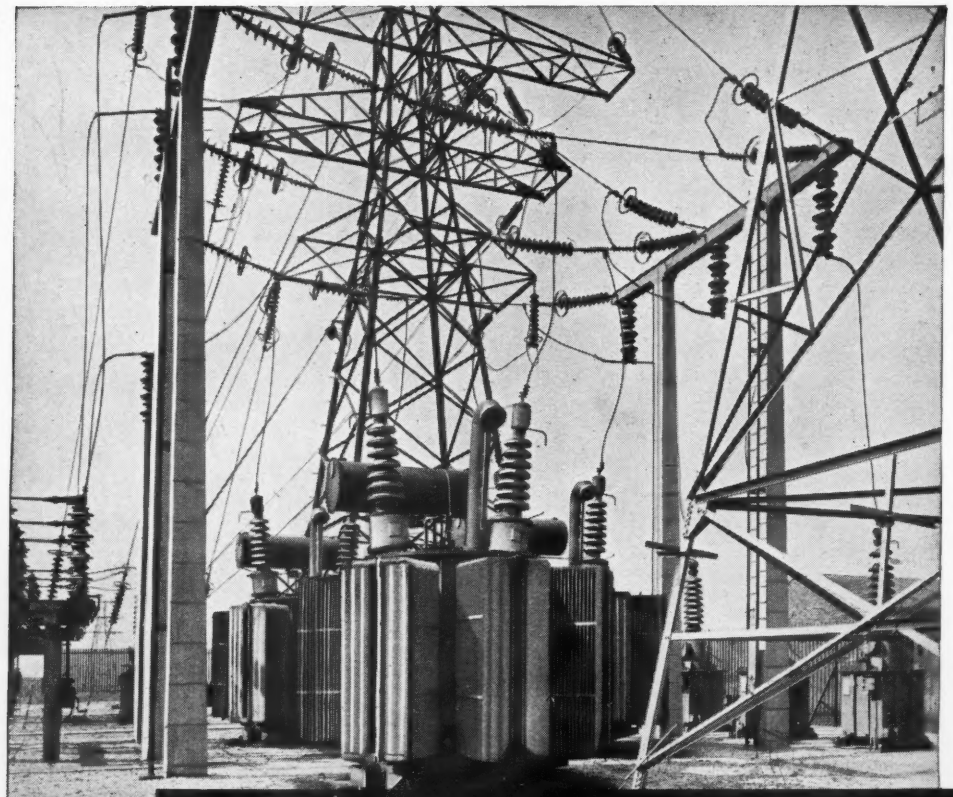

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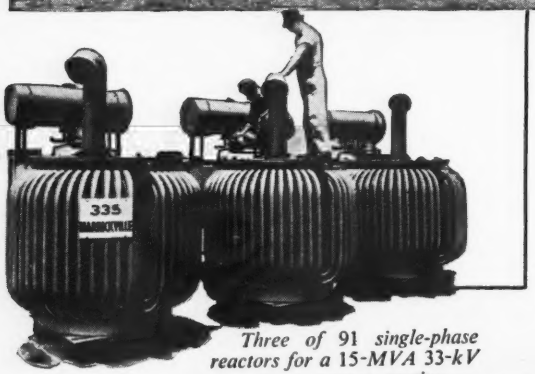
Group of three single-phase reactors for a 90-MVA 132-kV Power link at a British Grid substation.



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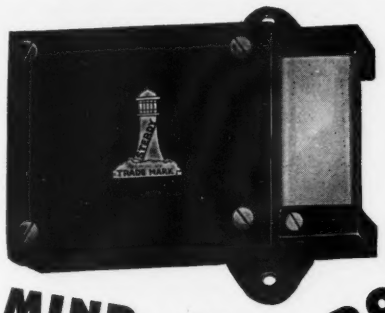

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Careers in Electricity

This is an extract from a recorded interview with E. O. Maxwell, an established C.E.A. engineer, aged 26.

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Q.M.: **What first made you come into the Industry?**

Mr. Maxwell: I saw an advertisement for graduate training and it struck me that in power stations I could get the type of experience I wanted—variety and responsibility.

Q.M.: **Any particular reason why you chose this part of the world?**

Mr. Maxwell: Only that my people were living in the South of England so I voted to do my training here.

Q.M.: **After your training . . .?**

Mr. Maxwell: I was appointed Assistant Engineer—plant testing—Croydon B. My first ambition, of course, was to be in charge of a shift.

Q.M.: **Which you were. Weren't you a Charge Engineer before you were 23?**

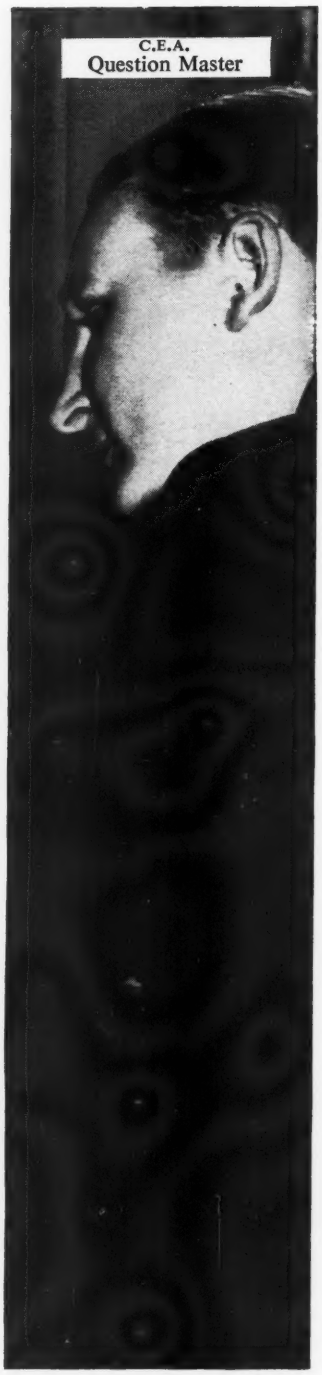
Mr. Maxwell: Yes. Assistant two years and two months, then Charge Engineer. I was very keen on being responsible for staff and it suited me fine.

Q.M.: **What are your plans now?**

Mr. Maxwell: Well, my plan at the moment is to gain as much experience of the design and construction—construction side mainly—of nuclear power stations. Actually I shall be going, for two years, to one of the Atomic groups in about four weeks' time. My ultimate aim is really to get back into power stations.

Q.M.: **You don't see yourself spending all your time in a nuclear power station?**

Mr. Maxwell: Oh, no. I'm much too young at the moment to specialise. I want to get as much general experience as I can.



We'd like to publish more of this interview, but there isn't space. For details of the many careers in Electricity Supply, and the salaried training schemes available, please write to:

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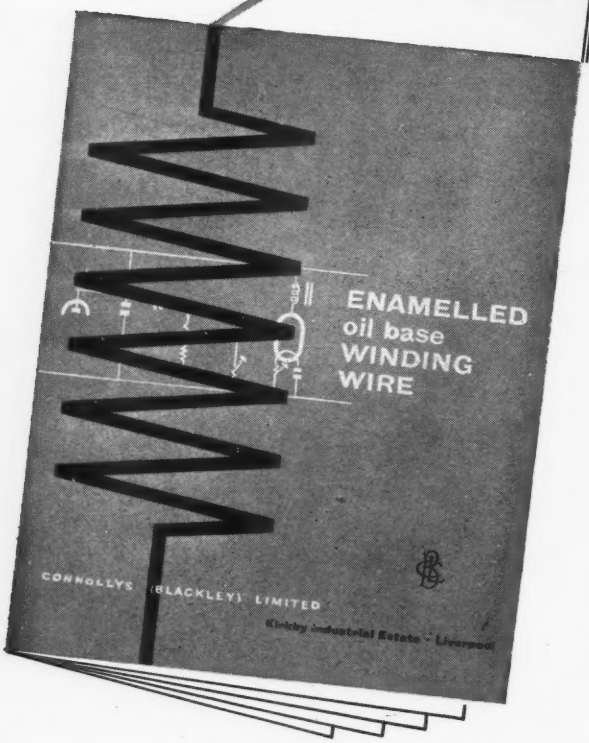

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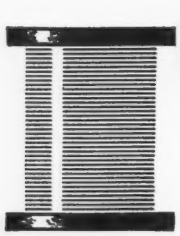

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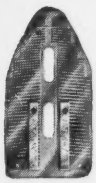

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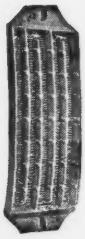

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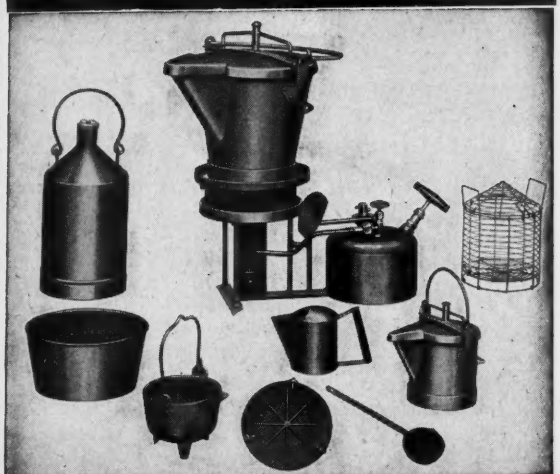

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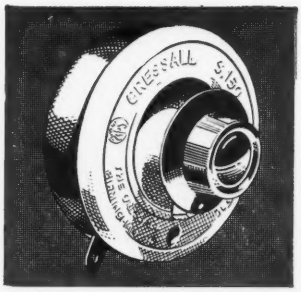

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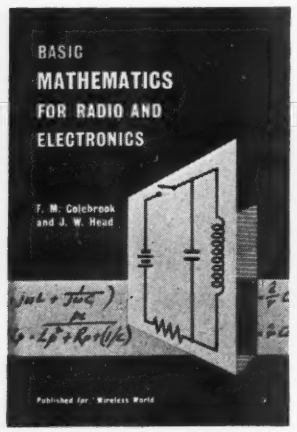

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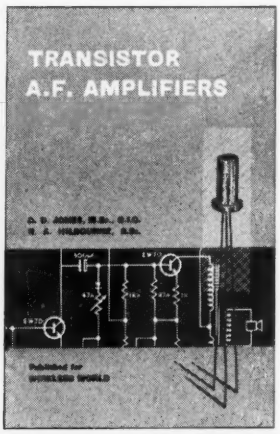

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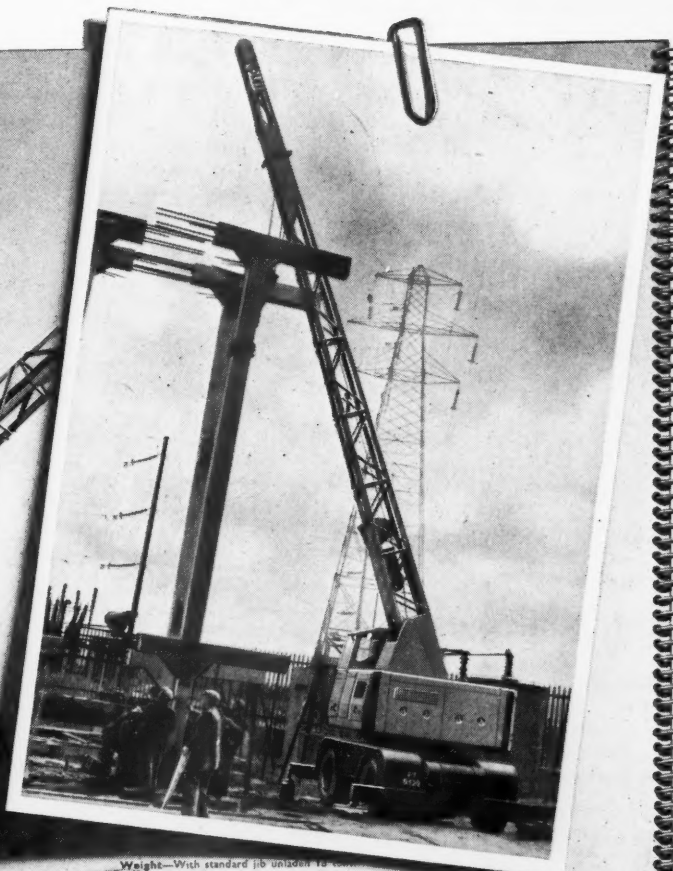

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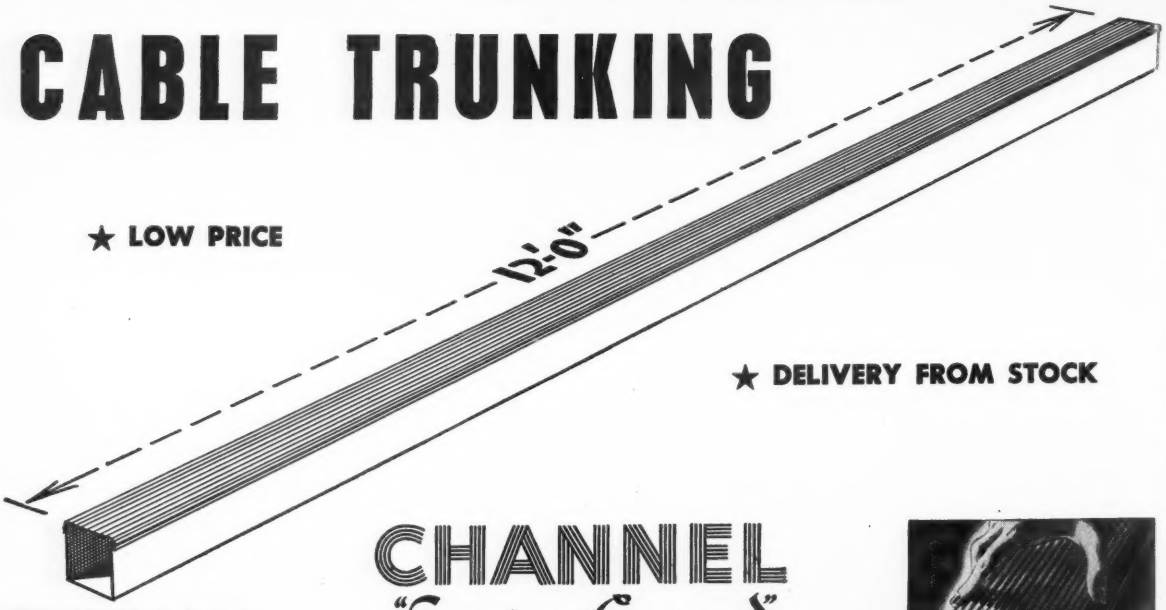

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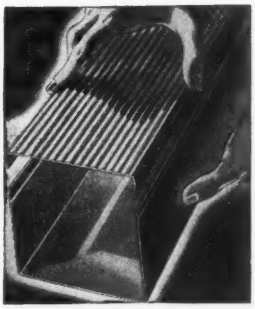

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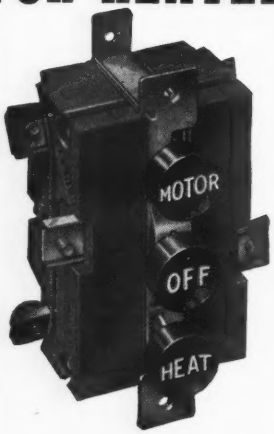

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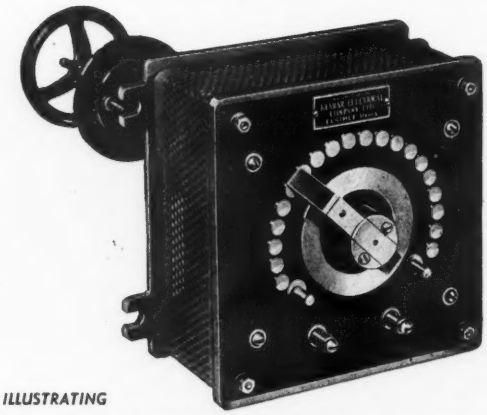

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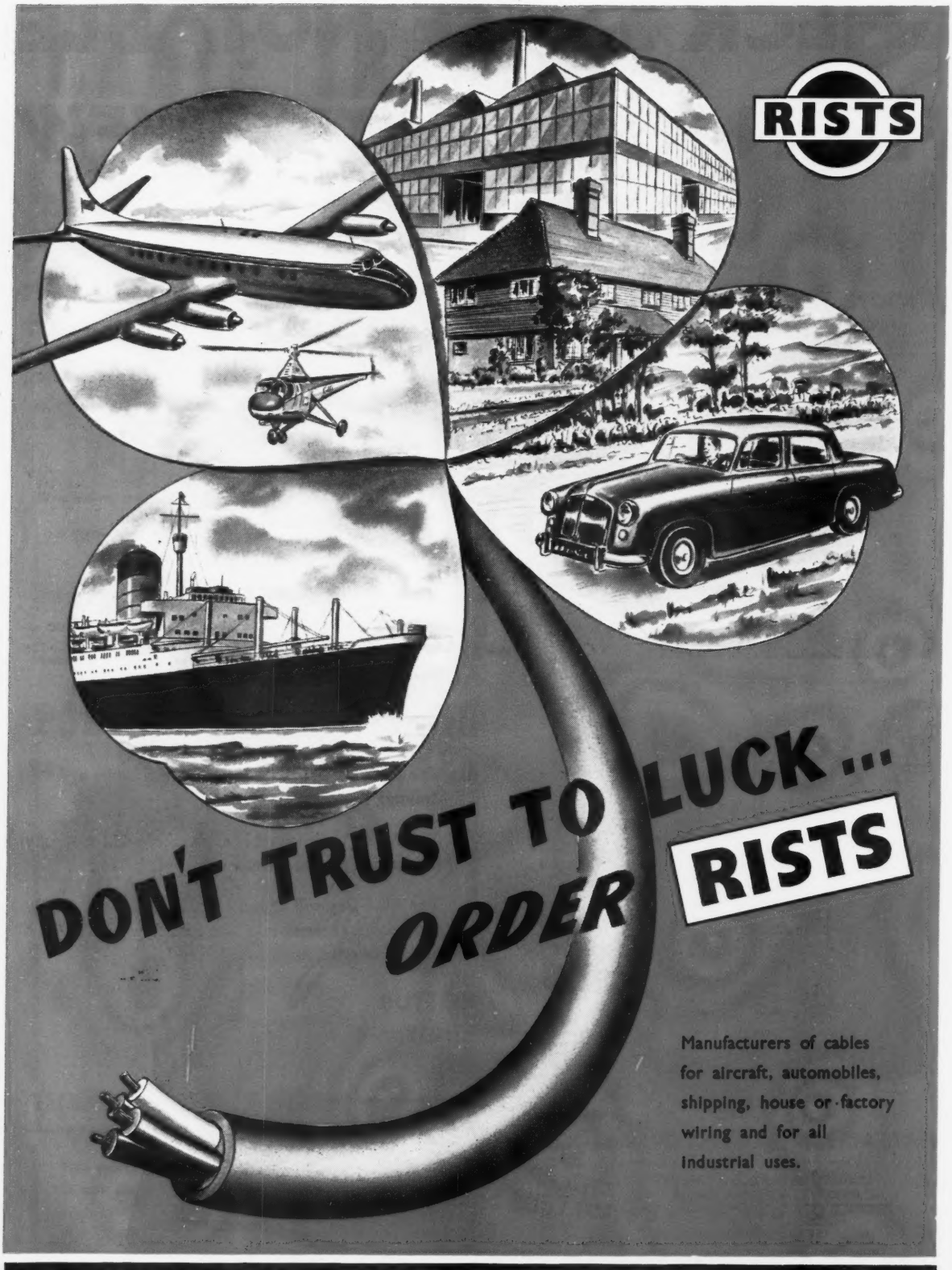
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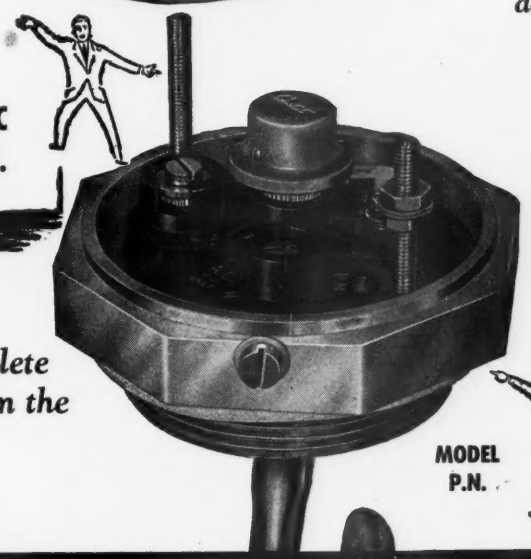

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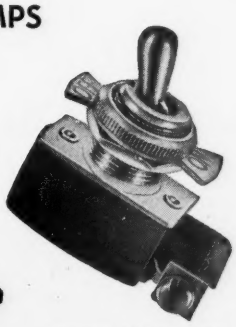

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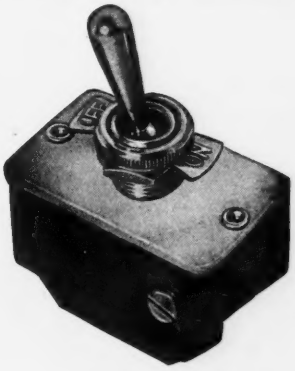

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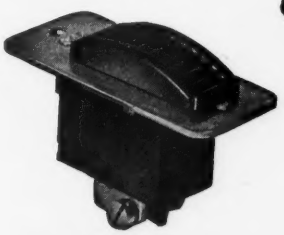

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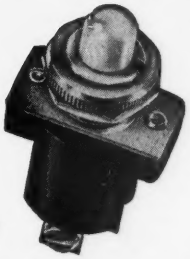

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For refrigerators

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For ¼" spindles

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ARCOLECTRIC SWITCHES · LTD

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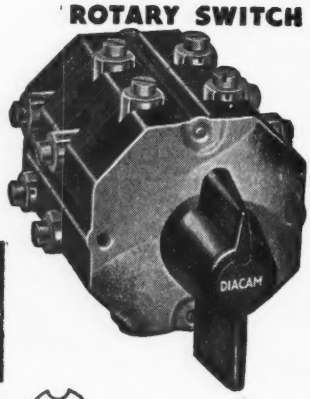
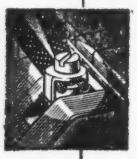
When there is a better switch Arcolectric will make it

THE VERSATILE DIACAM ROTARY SWITCH

This 30-amp. rotary switch has solid silver contacts and a double-break on each pole, ensuring maximum efficiency and absolute safety under all conditions. Available in most sequences for either single or multi-pole switching.



This shows the patent terminal clamp securing two conductors



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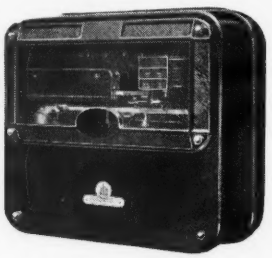

Type AMJ/P/2, double element, rolling ramp pattern, projecting mounting

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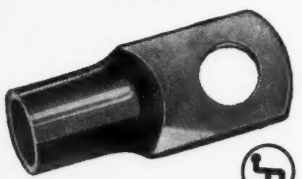

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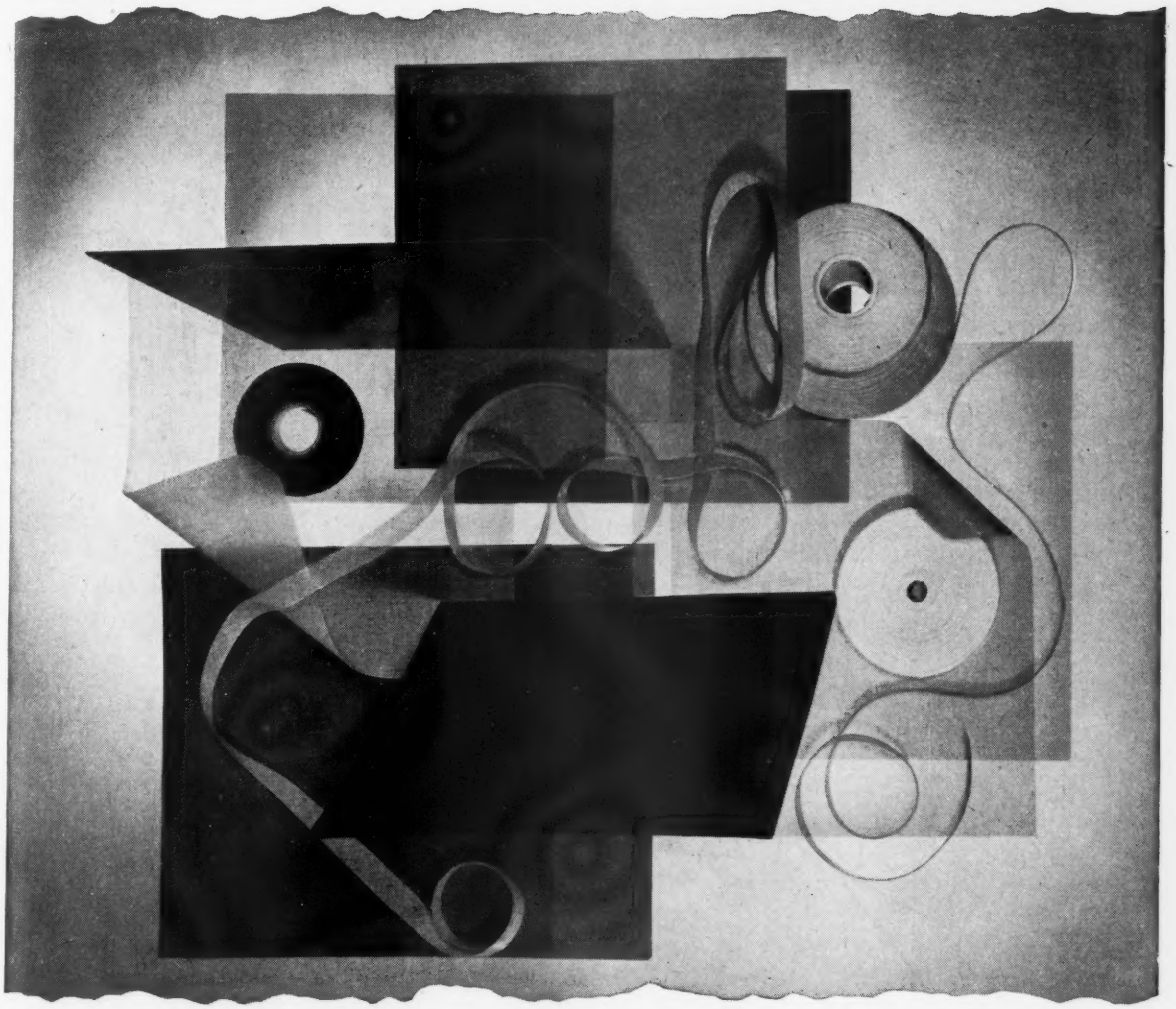

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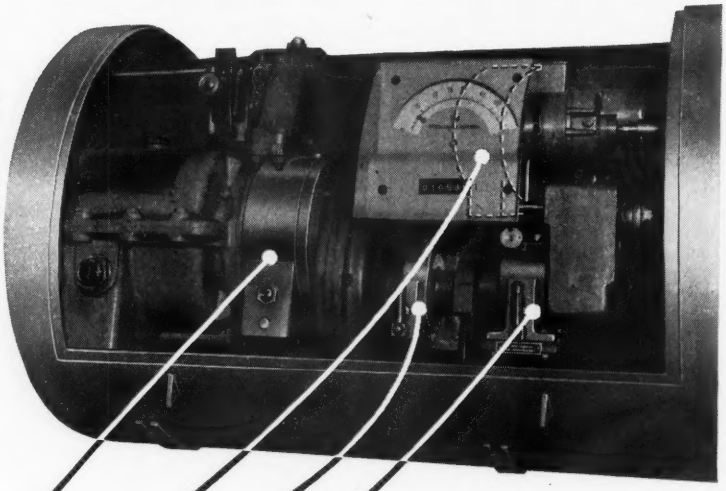
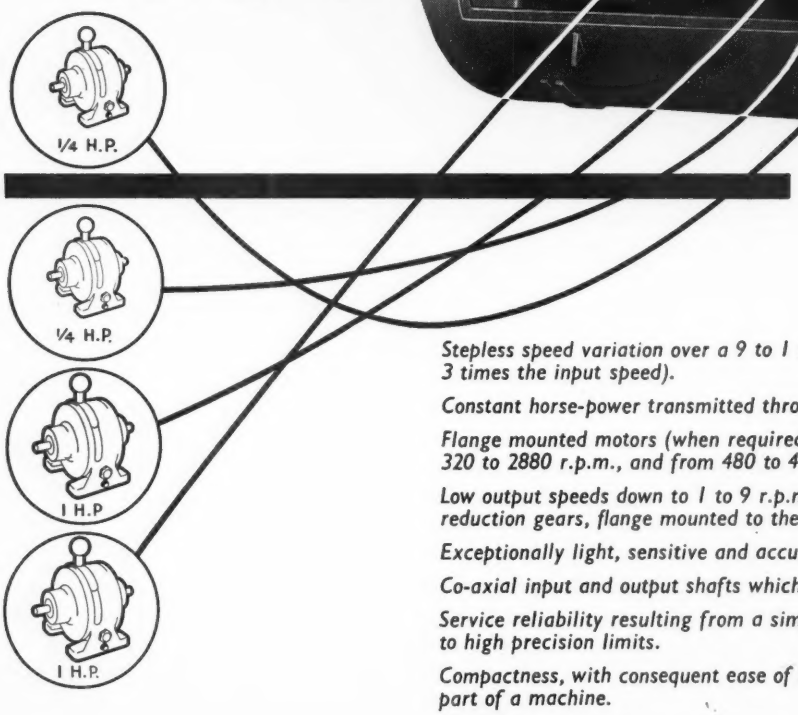
One of many applications for the Kopp GEARLESS GEARBOX

4 VARIATORS
are incorporated on this Pendan Feeder manufactured in quantity by F.L. Smidth & Co. of Copenhagen





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Constant horse-power transmitted throughout the speed range.

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THE USE OF HARDWOOD BLOCKS

REGULATION 209(B) of the REGULATIONS for the ELECTRICAL EQUIPMENT of BUILDINGS, issued by the Institution of Electrical Engineers, provides that the enclosure of the termination of wiring shall be incombustible. As explained in INTERPRETATION No. 11 (3rd September, 1956) published by the Institution :—

"The use of switchgear, accessories and lighting fittings which themselves provide enclosure and protection for non-sheathed cable cores permits ready compliance with the requirements. Switchgear, accessories and lighting fittings with recessed backs may be mounted on British Standard Boxes. Alternatively they may be mounted on the building structure if it is of brick, stone, hardwood (but not hardboard), plasterboard or lath-and-plaster, provided that the surfaces are continuous and undisturbed and free from paper, and that secure mechanical fixing is obtained. Any cable holes that may be necessary through the supporting material must be accurately and neatly drilled and plugged with fire-resisting compound."

THE USE OF WOOD BLOCKS TO SUPPORT ACCESSORIES HAVING RECESSES FOR WIRING IS THUS RECOGNISED PROVIDED THEY ARE OF BEECH, OAK (ENGLISH), TEAK OR MAHOGANY, AND SUBJECT TO THE PRECAUTIONS INDICATED IN INTERPRETATION NO. 11

The foregoing has been drafted in consultation with the INSTITUTION of ELECTRICAL ENGINEERS and the NATIONAL INSPECTION COUNCIL for ELECTRICAL INSTALLATION CONTRACTING

Issued by THE ASSOCIATION OF BRITISH WOOD BLOCK MANUFACTURERS

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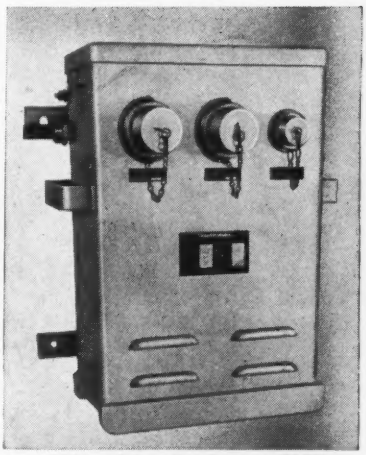
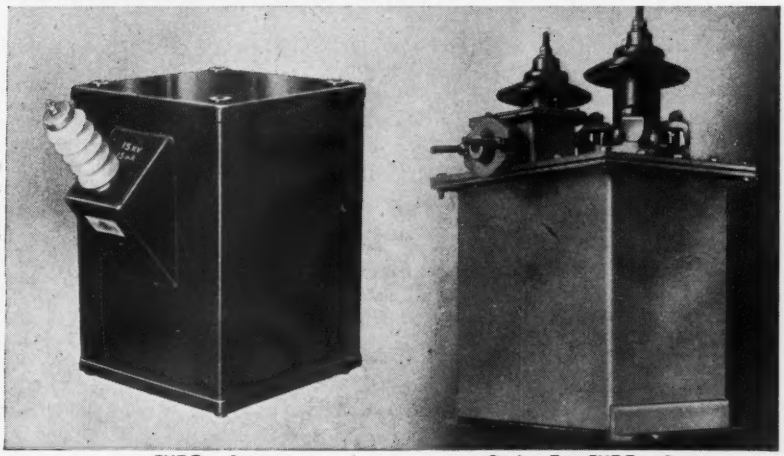


2 kV Low Voltage Transformer to BS 794



EHT Transformer *Outdoor Type EHT Transformer*

The Partridge range of transformers covers nearly every normal replacement requirement in industry. The range includes Power Transformers, single or multiphase, up to 25 kVA. Also a full range of Low Voltage Units for the safe operation of Hand tools, etc. These are available in both portable and wall types. Full literature and Drawing 2961 are available on request. We specialise in design and development work and welcome enquiries for industrial units to meet individual requirements.

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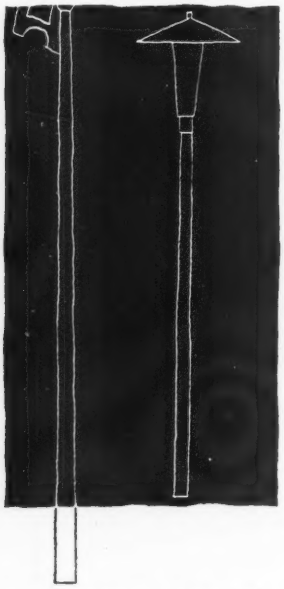
THE NEW HORSTMANN TYPE 'K' MK II TIME SWITCH

provides light on time



at lower cost

The new type "K" Mark II Time Switch meets the demand for a simple synchronous motor driven switch, low in cost yet accurate and reliable in use.

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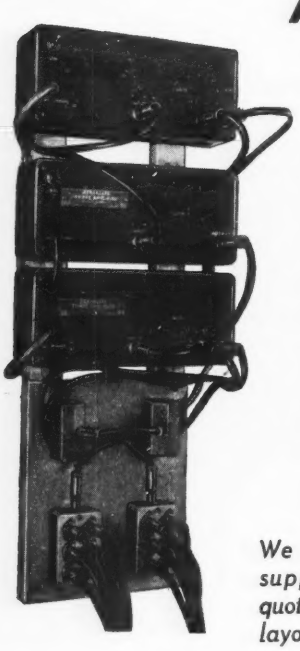

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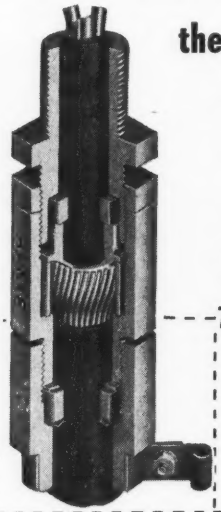

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The new

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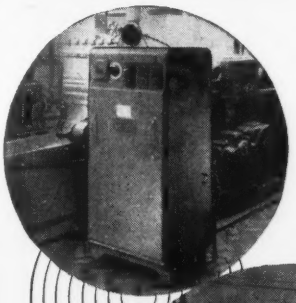
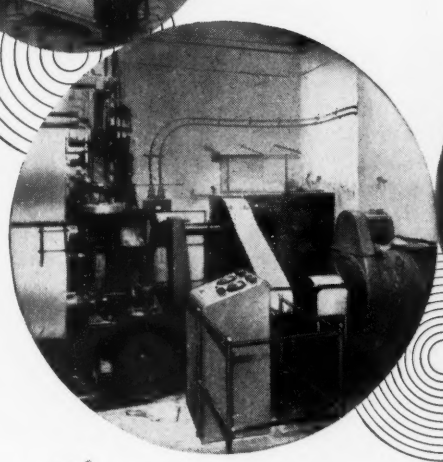
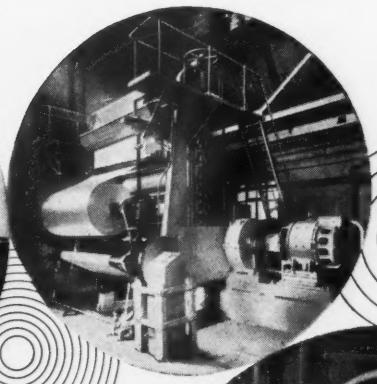
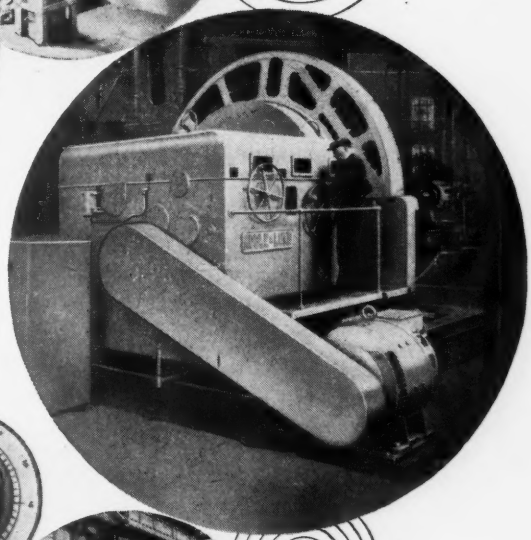


The Answer to the Problem of *VARIABLE* SPEED DRIVES...







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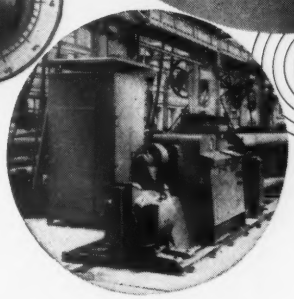

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Available for outputs between 1 H.P. and 1000 H.P. with a speed range of up to 40/1, the Varionic drive can be arranged to suit your particular application.

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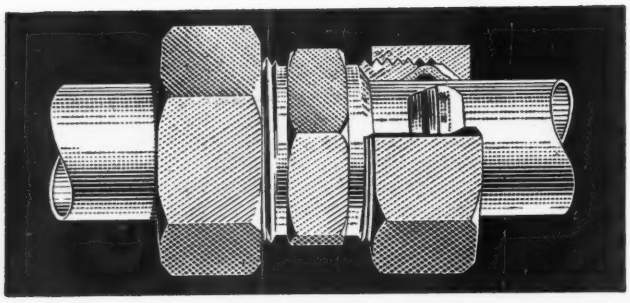

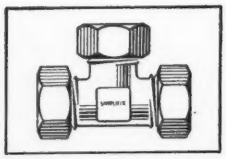

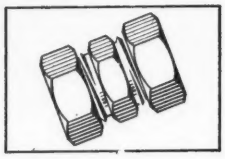

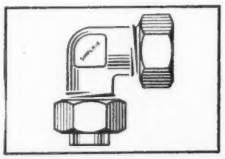

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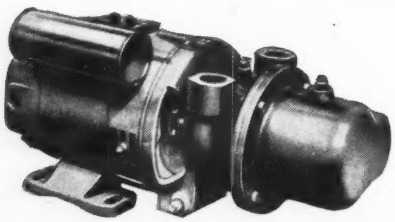

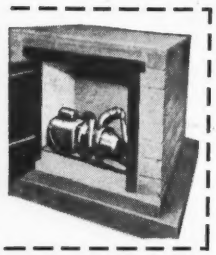

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- **It can be neatly tucked away in the garden—or it is silent in operation for indoor installation.**
- **It can also be used for pumping supernatant water from cesspools.**
- **No oiling or greasing required.**

The MONO pump

Attractive terms to Dealers

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BENDS: ⅜", ¾", 1", 1¼", and 1½" screwing size conduit. (Also ¼" to 1" nom. bore gas and steam.)

NOTE THESE FEATURES

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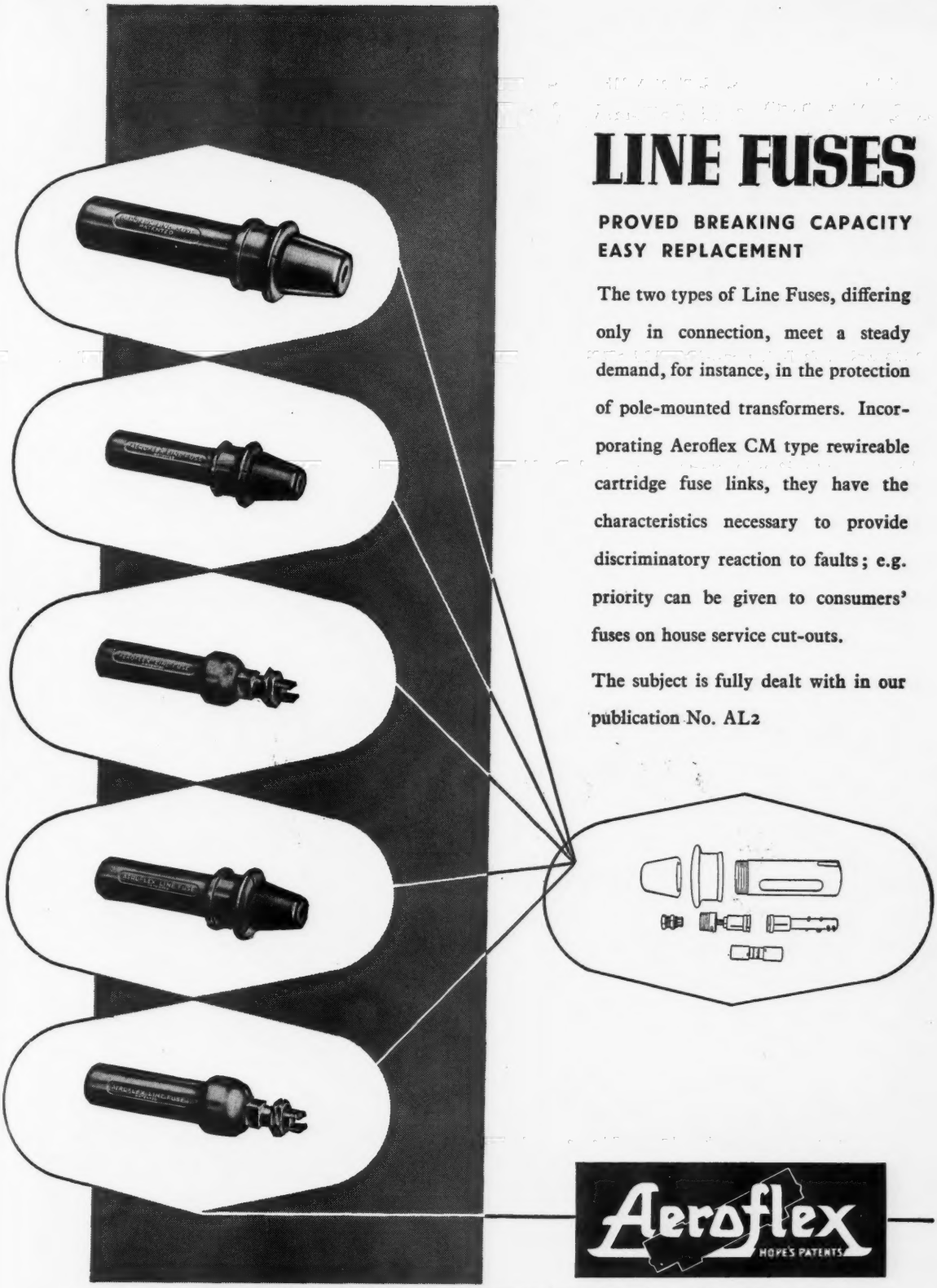
- **Designed for bolting to bench, holding in vice or mounting on portable stand with detachable legs.**

Send for further details to:

HILMOR LTD. (Sales & Service)

CAXTON WAY, STEVENAGE. HERTS

Phone: Stevenage 881 *Grams: Tubenders, Stevenage*



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PROVED BREAKING CAPACITY EASY REPLACEMENT

The two types of Line Fuses, differing only in connection, meet a steady demand, for instance, in the protection of pole-mounted transformers. Incorporating Aeroflex CM type rewireable cartridge fuse links, they have the characteristics necessary to provide discriminatory reaction to faults; e.g. priority can be given to consumers' fuses on house service cut-outs.

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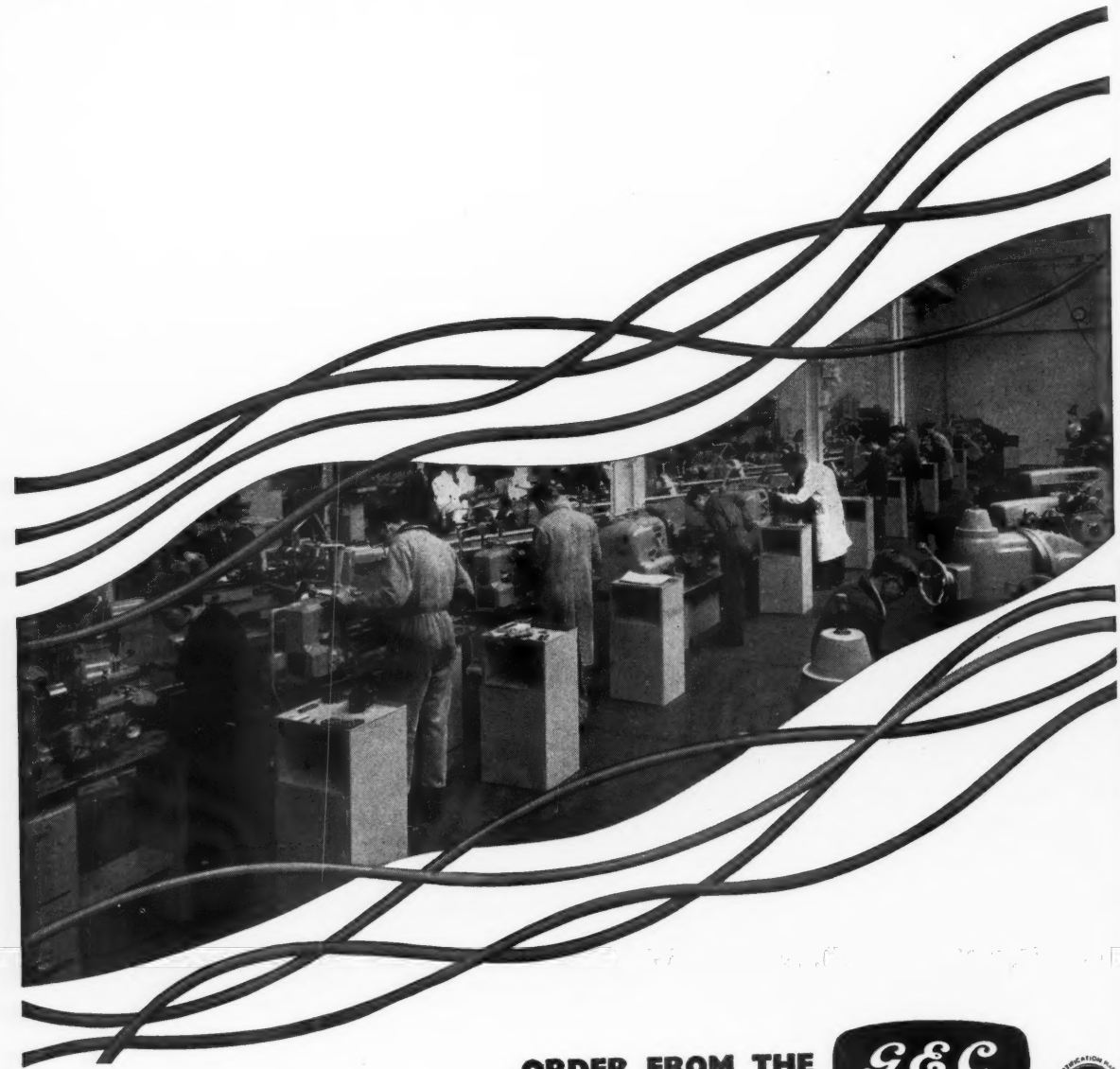

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Four Argon Arc and Metallic Arc Welding Sets.
One Portable Automatic Argon Arc Welding Set.
One Automatic Argon Arc Machine.

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Two 60-75-kVA Spot and Stitch Welding Machines.
One 25-kVA Foot/Air-operated Spot Welding Machine.
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One Light Alloy Spot and Stitch Welding Machine.

Forms of tender may be obtained from the above address on or after 30th August, 1957, at a fee of 10s. for each tender set, which is not refundable. If payment is made by cheque, it should please be made payable to "High Commissioner for India." Tenders are to be delivered by 2 p.m. on Thursday, 3rd October, 1957.

Please quote clearly the tender number required. 7302

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Salary H.9, £885-£930 per annum.
Applicants should possess H.N.C. or equivalent qualifications and have had experience in a modern generating station.

FOURTH ASSISTANT ENGINEER, CARDIFF TRANSMISSION SECTION (Vacancy No. 139/57).
Salary will be in accordance with Class AX/DX, Grade 6, £710-£910 per annum of the National Joint Board Agreement.
Applicants should have had practical experience in the maintenance and operation of high voltage overhead lines and substation equipment.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Application forms obtainable from Secretary, South Wales Division, Central Electricity Authority, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 10th September, 1957. 7308

BRITISH OXYGEN GASES LIMITED

require a qualified
ELECTRICAL ENGINEER

for work in their Sales Technical Department. The work is in connection with prototypes of electrical power units used in connection with electrical welding equipment. A young engineer who has recently qualified, having completed a good apprenticeship, and wishes to pursue a commercial career, would be suitable. Age range 24-30.

Write, giving details, to Personnel Manager, Bridgewater House, Cleveland Row, St. James's, London, S.W.1. 7269

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Essex Sub-Area, Chelmsford District

DEMONSTRATOR (112/57.R).
Candidates should have suitable domestic science qualifications and hold the E.A.W. Certificate for Demonstrators.
Salary N.J.C. Grade 1 (£500-£600), although progress beyond £540 will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade.
Apply by letter within 14 days to R. J. Honniball, Manager, Chelmsford District, Eastern Electricity Board, Anchor Street, Chelmsford, Essex.

Norfolk Sub-Area, King's Lynn and Western District

THIRD ASSISTANT ENGINEER (113/57.R).
Applications are invited for the above appointment which will be based on King's Lynn.
Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.
Salary N.J.B. Class F, Grade 9 (£790-£835).
Apply by letter within 14 days to the Manager, King's Lynn and Western District, Eastern Electricity Board, Gaywood Bridge, King's Lynn, Norfolk.

Northmet Sub-Area, Enfield District

TWO FOURTH ASSISTANT ENGINEERS (Ref. 594) (114/57.R).
Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems, including substations.
Salary N.J.B. Class F, Grade 11 (£685-£730) plus London allowance.
Apply by letter to F. H. Long, M.I.E.E., M.Amer.I.E.E., Manager, Eastern Electricity Board, 40, Church Street, Enfield, Middlesex, by 9th September, 1957.

Suffolk Sub-Area, Stowmarket District

COMMERCIAL ASSISTANT (115/57.N).
Candidates should have had a sound training and subsequent experience in commercial development work in a rural area. Ability to assist in the preparation of estimates for all types of industrial, agricultural and domestic installations is essential, as well as a good working knowledge of the general duties attaching to a District Commercial Department.
Salary N.J.C. Grade 3 (£680-£740).
Apply by letter to the Manager, Stowmarket District, Eastern Electricity Board, Electricity Offices, Ipswich Road, Stowmarket, Suffolk, by 20th September, 1957. 7310

SENIOR TECHNICAL SALES ENGINEERS

required to introduce and sell fluid power transmission equipment to those manufacturers who make and want the best.

Applicants should have matriculation standard, have good engineering background, possess intimate knowledge of mechanical processes combined with electrical drives and transmissions; age approx. 40.

Give full details of education, qualifications and experience, stating branch of industries and firms concerned and present salary.—Box 7229.

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

THIRD ASSISTANT ENGINEER (Operation and Maintenance).
Applicants should possess qualifications equivalent to Higher National Certificate in Electrical Engineering and have had operational and maintenance experience on high-voltage distribution systems.
Salary N.J.B. Class M, Grade 10, £1,065/£25/£1,140 per annum.

FOURTH ASSISTANT ENGINEER (Distribution Design).
Applicants should hold the Higher National Certificate in Electrical Engineering and have had experience on overhead and underground distribution systems. The successful candidate will be employed on planning and estimating system development schemes.
Salary N.J.B. Class M, Grade 12, £935/£20/£995 per annum.

SHEFFIELD NORTH DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER.
Applicants should be technically qualified up to Higher National Certificate standard and have had experience in planning and estimating, construction, operation and maintenance on underground and overhead distribution systems up to 11 kV.
Salary N.J.B. Class K, Grade 9, £995/£20/£1,055 per annum.
Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 13th September, 1957.

No. 5 (Wakefield) Sub-Area

BARNSLEY DISTRICT
ASSISTANT CONSUMERS' ENGINEER.
Applicants should preferably have had experience in negotiations for new supplies and advice on supplies and tariff matters, including proposed wiring installations and industrial and agricultural equipment, disputed accounts involving technical or metering problems, and investigation of voltage complaints and assisting with street light negotiations. Candidates should preferably have attained the technical standard of the Ordinary National Certificate in Electrical Engineering.
Salary N.J.B. Class G, Grade 13, £635/£15/£680 per annum.
Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 13th September, 1957. 7314

ELECTRICAL DESIGNER

sought by established manufacturers in London with world market for special-purpose precision machinery. Exceptional prospects for qualified electrical engineer having practical experience, aged 30-40, who is possessed of the "creative spark."

Only applicant fertile in ideas, with original and inventive mind and receiving recognition in his present post on this account, need apply.

Write, in confidence, Personnel Manager, Molins Machine Co. Ltd., Evelyn Street, London, S.E.8.

7026

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following vacancies in this Division :—

COAL AND ASH HANDLING ENGINEER, WILLINGTON "A" POWER STATION
(Vacancy No. 67/57/ER).

The successful applicant will be required to supervise the operation of the coal and ash handling plant at this station. He will also be responsible for organising the coal and fuel oil deliveries and for the disposal of ash.

Experience of similar duties in a P.F.-fired station, and of the control of staff, will be an advantage.

The salary will be in accordance with Class K, Grade 9 (£995-£1,055 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11th September, 1957.

SECOND ASSISTANT ENGINEER (Mechanical), GENERATION (Construction) DEPT., CASTLE DONINGTON POWER STATION SITE
(Vacancy No. 142/57/ER).

Applicants should have had a fundamental training in mechanical engineering, including workshops, together with experience in the manufacture and erection of heavy mechanical plant as installed in a modern power station. Experience in the operation and maintenance of H.P. boiler plant will be an advantage. It would be an advantage for candidates to have a university degree or equivalent qualification in mechanical engineering.

The salary will be in accordance with Class AX/EX, Grade 2 (£1,145-£1,410 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11th September, 1957.

FOURTH ASSISTANT ENGINEER, COVENTRY TRANSMISSION SECTION OFFICE
(Vacancy No. 144/57/ER).

Applicants should have experience of the maintenance and operation of E.H.T. overhead lines, transformer and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 5 (£810-£1,035 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11th September, 1957.

OPERATIONS ENGINEER, WILLINGTON "A" POWER STATION
(Vacancy No. 145/57/ER).

Applicants should have received a sound technical training and have had considerable experience in the operation and maintenance problems arising in a modern power station.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership, and a knowledge of pulverised fuel firing will be an advantage.

Salary will be in accordance with Class K, Grade 6 (£1,235-£1,325 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th September, 1957.

ASSISTANT ENGINEER (Mechanical Maintenance), WILLINGTON "A" POWER STATION
(Vacancy No. 146/57/ER).

Applicants should have received a sound technical training and have had wide practical experience in the maintenance of power station mechanical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class K, Grade 7 (£1,160/£1,235 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th September, 1957.

ASSISTANT ENGINEER (Electrical Maintenance), WILLINGTON "A" POWER STATION
(Vacancy No. 147/57/ER).

Applicants should have received a sound technical training and have had practical experience in the maintenance of power station electrical plant.

Preference will be given to candidates who are corporate members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class K, Grade 8 (£1,065-£1,140 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th September, 1957.

ASSISTANT SHIFT CHARGE ENGINEERS, WILLINGTON "A" POWER STATION
(Vacancy No. 148/57/ER).

Applicants should have received a sound technical training and have had experience in a modern power station.

Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class K, Grade 9 (£995-£1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 18th September, 1957.

STATION SHIFT CONTROL ENGINEER, SPONDON POWER STATION
(Vacancy No. 150/57/ER).

Applicants should have had a sound training and practical experience in a modern power station. The possession of a Higher National Certificate in Electrical Engineering, or its equivalent, would be advantageous.

Salary will be in accordance with Class H, Grade 10 (£835-£880 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 18th September, 1957.

These appointments will be pensionable within the provisions of the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

21st August, 1957. 7265

JOSEPH LUCAS (ELECTRICAL) LTD.

Great King Street, Birmingham

AS a result of expansion of our road vehicle lighting development department to meet the growing demands of the motor industry we have vacancies for

ENGINEERS AND PHYSICISTS

of at least H.N.C. standard to work on the following projects. Experience or knowledge of photometric and electrical instruments desirable.

The design and development of vehicle lighting equipment and in particular the development of optical systems for future projects.

Development work on specific problems related to vehicle lighting equipment and the design of laboratory and factory control equipment for these products.

In addition there are vacancies for SENIOR DESIGNERS required to work in close co-operation with car designers and styling engineers on the design of lighting equipment for new car models. Experience in the design of pressed metal components for large quantity production desirable.

All of these positions carry attractive starting salaries and provide excellent prospects for advancement. Staff pension fund.

Apply in writing, stating age, qualifications and experience, to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/156.

127

PROTON SYNCHROTRON for the NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY (Research Group) invite applications from PHYSICISTS and ENGINEERS for a number of posts in the project team concerned with the design, construction and commissioning of a seven thousand million Electron Volt Proton Synchrotron at Harwell, Berkshire.

RESEARCH AND DEVELOPMENT.

Physicists and electrical engineers will be recruited in the Scientific and Experimental Officer classes. Knowledge of Particle Accelerators is not essential, though experience in one of the following fields is desirable :—

- Electro magnets or transformers.
- Heavy duty electrical machinery, rectifiers and switchgear.
- Radio frequency systems, especially in the range 1/100 Mc/s.
- High-vacuum systems and associated monitoring and control equipment.
- Electronics, including control circuits and instruments of all kinds.

ENGINEERING DESIGN, CONSTRUCTION AND MAINTENANCE.

Senior posts are available for engineers with proved ability in similar large development projects, preferably but not essentially of an electro-mechanical nature. The right experience for other responsible posts will have been obtained by engineers trained in any of the following :—

- Heavy electrical plant and equipment installations.
- Plant and equipment for research and development.
- Complex central circuitry.
- Test plants for switchgear and rotating machines.
- Rectifier systems.
- Steel works.

Salaries (depending upon age, qualifications and experience) : Scientific Officer and Engineer classes, up to £2,080 ; Experimental Officer class, up to £1,630.

For further details and an application form, please send a POSTCARD to : Recruitment (905/48), A.E.R.E., Harwell, Didcot, Berks. 7258

CENTRAL ELECTRICITY AUTHORITY

Southern Division

S/13.942

APPLICATIONS are invited for the following position:—

SHIFT CONTROL ENGINEER, EARLEY GENERATING STATION.

Applicants should have had appropriate experience in a modern generating station, and manufacturing works experience will be an advantage. Candidates should possess H.N.C. or equivalent, and preferably possess or be studying for qualifications leading to Corporate Membership of an appropriate professional institution.

Salary N.J.B. Class G, Grade 10, £790 × £15 to £835 + 10% shift allowance.

Special application forms, obtainable from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 11th September, 1957. 7307

SOUTH WESTERN ELECTRICITY BOARD

Cornwall Sub-Area

THIRD ASSISTANT ENGINEER. Salary N.J.B. H.10 (£835/£880 p.a.).

The successful candidate will be attached to the Sub-Area Technical Dept. but be based at St. Austell. He will assist in the construction, operation and maintenance of equipment in 33/11-kV and 11-kV/L.V. substations. Emergency duties on the basis of general availability.

H.N.C. or equivalent desirable.

Applications on standard form AE6/ACT, obtainable from Manager, Cornwall Sub-Area, S.W.E.B., Pool, Redruth, should be returned by 10th September. 7301

EAST MIDLANDS ELECTRICITY BOARD

(a) SECOND ASSISTANT ENGINEER (Substation Construction), NORTHAMPTONSHIRE SUB-AREA.

(b) THIRD ASSISTANT ENGINEER (Substation Construction), NORTHAMPTONSHIRE SUB-AREA.

(c) THIRD ASSISTANT DISTRICT ENGINEER, WELLINGBOROUGH DISTRICT.

APPLICATIONS are invited for the above appointments.

Candidates for posts (a) and (b) should possess a technical qualification equivalent at least to the Higher National Certificate in Electrical Engineering, and should have experience of both overhead and underground systems up to and including 33 kV; particularly in the construction and equipment of substations, including protective gear and control schemes for switchgear, transformers and associated equipment. For post (a) experience of grid point or major step-down substation equipment and layout is also required.

Candidates for post (c) should preferably possess a technical qualification equivalent to the Higher National Certificate in Electrical Engineering and have had experience in the construction, operation and maintenance of overhead and underground distribution systems up to and including 11 kV. The successful candidate must be able to drive a motor vehicle and may be required to undertake standby duties.

The salaries and conditions of the appointments will be in accordance with the National Joint Board Agreement as follows :—

Second Assistant Engineer:
Class K, Grade 7
(£1,160 × £25 to £1,235 per annum).

Third Assistant Engineer:
Class K, Grade 9
(£995 × £20 to £1,055 per annum).

Third Assistant District Engineer:
Class E, Grade 9
(£740 × £15 to £785 per annum).

Applications stating age, education, qualifications, experience, present position and salary should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, to reach him within fourteen days of the issue of this advertisement. 7295

UGANDA ELECTRICITY BOARD

THE Commercial Department of the Board has been fairly recently established. A senior COMMERCIAL ASSISTANT is now required in the Department at the Board's Head Office in Kampala.

Candidates, between 30 and 40 years of age, should have a sound engineering background and particular interest in the utilisation of electricity. Duties will be general and will cover a wide range of interesting commercial work. A man with enthusiasm and imagination will find much satisfaction in the great amount of development required throughout the Board's area of supply with all types of consumers.

As much of the Board's prospective load is allied to agriculture, knowledge of the application of electricity in agriculture and associated industries will be helpful. Candidates with experience of East Africa and knowledge of the local language will be preferred.

Salary range £1,320-£1,590 per annum; commencing point according to age, qualifications and experience.

Uganda has a pleasant climate and income tax is moderate. Maximum tour three years. 5 days' vacation leave on full salary for each month of service, plus local leave. Up to three adult passages provided to and from Uganda. Free partly furnished accommodation, medical and dental treatment. Provident fund or pension facilities available.

Application forms and further information may be obtained from the London Representative, Uganda Electricity Board, 27, Regent Street, London, S.W.1, to whom completed forms should be returned not later than 30th September, 1957.

E. H. WILSON,
Secretary. 7290

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

SENIOR ASSISTANT
(Accounting Department) (Headquarters).

Duties will include responsibility for the section dealing with stores accounting and control records, clearance and payment of creditors' invoices, payment of rents and wayleaves. Experience in supervision of staff and in punched card methods would be an advantage and the possession of a recognised accountancy qualification is desirable. Salary £945/£1,020 per annum (N.J.C. Grade 6).

Apply by letter, within fourteen days, stating full details of age, education and experience, to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126, London Road, Gloucester.

North Staffordshire Sub-Area

GENERAL ASSISTANT DISTRICT ENGINEER
(Leek District).

Applicants should have had experience in all branches of distribution work including the operation and maintenance of high and low voltage underground and overhead distribution systems. Technical qualifications desirable. Salary £635/£680 per annum (N.J.B. Grade E.11).

Apply by letter, within ten days, stating full details of age, experience and present position to Mr. H. A. P. Caddell, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

Board Headquarters

ARCHITECTURAL DRAUGHTSMEN
(Chief Engineer's Department).

The successful applicants will be required to assist in the preparation of outline and detail drawings for offices, stores, substation and service centre buildings. Intermediate R.I.B.A. an advantage. Salary £595/£715 per annum (N.J.B. Schedule D, Grade 6).

Apply by letter, within fourteen days, stating full details of age, experience, present salary and position to the Secretary (Ref. FWC), Midlands Electricity Board, Mucklow Hill, Halesowen, Nr. Birmingham.

A. STEPHENS,
Secretary.
7309

NEW ZEALAND MINISTRY OF WORKS

Professional and Technical Staff

THE Ministry of Works, New Zealand, invites applications for the following vacancies on the Permanent Staff. Positions, qualifications desired and commencing salaries are as follows:

MECHANICAL ENGINEERING DIVISION.

5. MECHANICAL AND ELECTRICAL ENGINEERS.
Corporate Membership of the Institution of Mechanical or Electrical Engineers, London, whichever is appropriate. Commencing salaries £895-£1,465 per annum.

6. BUILDING SERVICES ENGINEERS.
Corporate Membership of the Institution of Mechanical Engineers or of the Institution of Heating and Ventilating Engineers, London. Commencing salaries £895-£1,465 per annum.

7. ASSISTANT MECHANICAL, ELECTRICAL or BUILDING SERVICES ENGINEERS.
A University Degree in Mechanical or Electrical Engineering or Graduate Membership of the above Institutions. Commencing salaries £810-£1,000 per annum.

8. MECHANICAL, ELECTRICAL or BUILDING SERVICES DRAUGHTSMEN.
Ordinary or Higher National Certificate in Mechanical or Electrical Engineering, or equivalent examination, and at least three years' experience in draughting, design and calculations. Commencing salaries £720-£1,000 per annum.

Enquiries, mentioning this paper and quoting reference No. 3/74/133, also stating the type and number of position sought, should be addressed to the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Full details of duties, experience desired, and general information on the conditions of employment in the New Zealand Public Service, together with application forms, will then be furnished. 6949

CENTRAL ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(b) CO-ORDINATING AND PLANNING ENGINEER, ACTON LANE POWER STATION (Vacancy No. 57/779).

Position is one of responsibility, covers supervision central works office responsible for planning and co-ordinating, costing, method study and records. Experience in modern power stations and good engineering qualifications an advantage. Applicants should have necessary organising ability, vision and appreciation of modern management techniques. Salary Class J, Grade 6 = £1,210 p.a.

(a) ASSISTANT ENGINEER (Shift) (3.3-kV Board), BATTERSEA POWER STATION (Vacancy No. 57/780).

Sound engineering training necessary followed by some experience in modern power station. Salary Class L, Grade 15 = £780 plus £74 shift p.a.

(a) ASSISTANT ENGINEER (Efficiency), DEPTFORD WEST POWER STATION (Vacancy No. 57/781).

Applicants should have had a good technical education and experience in investigation of the technical problems of power station operation. Knowledge of plant testing and operating statistics desirable. Duties include checking all matters associated with thermal efficiency. Salary Class J, Grade 13 = £780 p.a.

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, C.E.A., London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 10 days of this advertisement. 7266

NORTH WESTERN ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER, CENTRAL DISTRICT, MANCHESTER.

Duties will include the organisation and control of all commercial staff and functions of the District; supply of information and advice to all classes of consumers on electricity utilisation, tariffs and all matters concerning electricity services; organisation and supervision of contract wiring work and maintenance services on consumers' premises; control of service centres, demonstrations, exhibitions, etc.; organisation and supervision of consumer records.

Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,435 × £35 to £1,540 p.a., Grade H.2. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, by 16th September, 1957.

FOURTH ASSISTANT ENGINEER, SUB-AREA CONSUMERS' ENGINEER'S DEPT., OLDHAM.

Applicants should hold the H.N.C. in Electrical Engineering and should have practical training in applications of electricity in industrial premises.

A knowledge of street lighting, whilst not essential, would be an advantage.

Salary scale £790 × £15 to £835 p.a., Grade K.13. N.J.B. conditions.

Applications, naming three referees, to Sub-Area Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, by 7th September, 1957. 7262

BRITISH KLOCKNER SWITCHGEAR LIMITED

Chertsey, Surrey

TECHNICAL SALES ENGINEERS required for London and Home Counties. Knowledge of motor control gear; sales experience preferred but not essential. Apply giving full particulars to—Managing Director. 166

***Situations Vacant** (continued)*

SOUTHERN ELECTRICITY BOARD

Installation Assistant

SWINDON District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class F, Grade II (£685 × £15 to £730 per annum). N.J.B. conditions of service.

Applicants should have had experience in the preparation of specifications and estimates for all types of electrical wiring installations. They should be competent to supervise electricians and organise the allocation of work.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, and returned to him in envelopes suitably endorsed not later than 9th September, 1957.

Showroom Attendant

Basingstoke District of No. 3 (Portsmouth) Sub-Area, located at Alton. Salary in accordance with the General Clerical Grade of the N.J.C. Agreement (£200-£565 per annum). N.J.C. conditions of service.

Applicants should have had a good general education, and preference will be given to those in possession of a General Certificate of Education, or its equivalent. Applicants should have had experience in all showroom duties, and a knowledge of domestic apparatus, sales procedure, tariffs and consumer service will be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him in envelopes suitably endorsed not later than 9th September, 1957.

The successful candidates for the above appointments will be required to contribute to the Central Electricity Authority and Area Boards (Staff) Superannuation Scheme, if eligible. 7305

SHIFT ENGINEER

Applications are invited for the appointment of

SHIFT ENGINEER

at the

CENTRAL POWER STATION (WAR DEPARTMENT), ALDERSHOT

The post is that of Technical Officer Grade III in the Mechanical and Electrical Technical Grades of the War Department Organisation.

The provisional salary scale is £620 per annum (at age of 26) to £780 per annum plus shift disturbance allowance of 6s. 6d. per shift.

Qualifications: Ordinary National Certificate in Electrical and/or Mechanical Engineering or evidence of an equivalent standard in technical education; and five years' apprenticeship or its equivalent with engineering concern giving a good comprehensive training.

Experience: After completing apprenticeship or its equivalent, candidates should have at least three years' experience in charge of operation and maintenance of steam and diesel electricity generating plant and switchgear.

Experience of Babcock & Wilcox water-tube boilers, Brush Ljungstrom turbo-alternators and parallel operation with the public electricity is desirable.

Application, with copies of testimonials, should be submitted to Chief Electrical Engineer, Aldershot District, Central Power Station (W.D.), Thornhill Road, Aldershot, within 14 days of the date of this advertisement. 7287

LEO COMPUTERS LIMITED

ELECTRICAL DESIGN ENGINEER

A VACANCY exists for an Electrical Engineer to undertake design of the power supply equipment used in a large-scale digital computer. Experience in any of the following would be an advantage:—

Electrical installation.
Rectifier sets.
Low-power alternators.
Small switchgear and interlocking circuits.

This position is permanent and pensionable and offers good opportunities for an engineer wishing to enter this challenging field.

Applicants should have H.N.C. or equivalent qualification. Commencing salary £600-£1,000 p.a., according to experience.

Write to—

The Personnel Officer,
LEO COMPUTERS LTD.
38/42, Minerva Road, London, N.W.10

7261

ELECTRICAL FOREMAN

required by GOVERNMENT OF SOMALILAND PROTECTORATE for Public Works Department on contract for two tours each of 18/24 months in the first instance with prospects of permanency.

Salary in scale (including inducement addition and present temporary allowance of 10% of salary) £772 rising to £1,122 a year. Provident fund. Outfit allowance £60. Free passages for officer and wife. Free passages for four children or allowances towards education in U.K. Liberal leave on full salary.

Candidates must have completed apprenticeship covering work on HV and LV transmission and distribution equipment, house wiring, wiring for motors and other equipment, and repairs and overhaul of alternators, motors, etc. Knowledge of diesel engines an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2C/42405/EF. 7316

HAWKER SIDDELEY NUCLEAR POWER COMPANY LIMITED

has a vacancy for an experienced

PHYSICIST OR ELECTRICAL ENGINEER

with an interest in control analysis and analogue computing techniques, to participate in the comprehensive study of advanced nuclear reactor power plant.

Applicants should possess a good degree in physics or electrical engineering, and, although not essential, some related experience would be an advantage.

The salary will be commensurate with the responsibilities involved, and the appointment is pensionable subject to the normal qualifying period.

Applications in writing in the first instance to—

The Personnel Officer (PB),
Sutton Lane, Langley, Nr. Slough, Bucks.

7288

ELECTRICAL/MECHANICAL ENGINEERING DESIGNER

THIS senior position with Merseyside company of medium size calls for rotating machine design ability, both electrical and mechanical, of a high order. Experience on control gear and systems, including electronics, is equally desirable.

The company, associated with a large group, expects to pay an attractive four-figure salary to a top-flight designer who is looking for a challenging position in which he can both develop and extend the company's existing range of products. These products are of small/medium size and special-purpose type.

First-class qualifications are necessary; adequate benefits are available. Applications, which should include age and salary indication, will be treated most confidentially.—Box 7244.

MAWDSLEY'S LTD.

Dursley, Glos.

invite applications for the post of

TECHNICAL SALES ENGINEER

in the Midlands area. Basic and supplementary pension scheme. Specialised rotating electrical machines, D.C. or A.C., 1-300 kW.

Particulars required: age, education and technical training. Subsequent experience. Initial remuneration desired. 7267

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointment:—

Area Board Headquarters, Secretary's Dept., Estates and Wayleaves Section

WAYLEAVE ASSISTANT, Carliol House, Newcastle upon Tyne. Duties comprise negotiation of wayleaves for electric lines, settlement of damage claims for crops and property and correspondence and records associated therewith. Applicants must be car drivers and have one or more of the following: previous experience of similar work with a statutory body; sound knowledge and experience of agriculture; membership of appropriate professional institution. Consideration would, however, be given to applicants training in valuation or land agency who have completed intermediate professional examinations.

Salary (within Grade 3, £680/£740, or Grade 4, £765/£840, according to qualifications and experience) and conditions of service in accordance with N.J.C. (Administrative and Clerical Grades) Agreement.

Applications stating age, qualifications and experience to be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 7299

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

THIRD ASSISTANT ENGINEER, Operational Research Section

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER in the Operational Research Section of the Generation (Operation) Department with Headquarters at Stella North Power Station, near Newcastle upon Tyne.

The work of the section involves the application of operational research techniques to power stations for the purpose of increasing plant availability and improving the efficiency of operation maintenance.

Applicants should be qualified mechanical or electrical engineers, and previous experience of operational research is desirable, but not essential, as there will be opportunities for special training.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 4 (£895 - £1,110 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 17th September, 1957. 7293

SOUTH-EAST METROPOLITAN REGIONAL HOSPITAL BOARD

APPLICATIONS are invited for the following posts in the Regional Engineer's office:—

(1) SENIOR ASSISTANT ENGINEER (Mechanical).

Salary £1,060-£1,245 inclusive of London weighting allowance. Superannuable. Candidates must be Corporate Members of the Institution of Mechanical Engineers and have experience in the preparation of large steam boiler and other complex engineering schemes.

(2) ASSISTANT ENGINEER (Mechanical) and

(3) ASSISTANT ENGINEER (Electrical).

Salary in each case £730-£1,065 inclusive of London weighting allowance. Superannuable. Candidates should possess appropriate professional qualifications and have experience in the preparation of (Mechanical) heating and ventilating and other mechanical engineering schemes, and (Electrical) electric light and power and other electrical engineering schemes.

Applications stating age, qualifications and experience, with names of three referees, should reach the Secretary, 11, Portland Place, London, W.1, by 6th September. 7260

SOUTH EASTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (Operation and Maintenance),
Surrey Sub-Area Headquarters, Dorking.

Salary £790-£835 per annum in accordance with N.J.B. Class K, Grade 13. Superannuable.

Applicants of at least H.N.C. standard should have had a sound training in electrical distribution. Duties will chiefly consist of assisting in plant maintenance and the testing and commissioning of system protection. A knowledge of, or interest in, the latter would be an advantage.

Applications, naming two referees, on forms from C. W. Hughes, B.Sc., M.I.E.E., Surrey Manager, SEEBOARD, Rough Rew, Ridgeway Road, Dorking, Surrey, by 11th September, 1957.

ASSISTANT DISTRICT ENGINEER,
Medway District.

Salary £790-£835 under N.J.B. Class F, Grade 9. Superannuable.

Applicants should have had a good general education and be technically trained up to Higher National Certificate standard, and must have had practical training and experience in general distribution work for systems up to 11 kV.

Applications, naming two referees, to Ramsden Mellor, Esq., M.I.E.E., A.I.Mech.E., District Manager, SEEBOARD, Gardiner St., Gillingham, Kent, by 27th September, 1957.

A. L. BURNELL,
Secretary. 7311

FEDERATION OF NIGERIA

Electrical Engineer,
Inland Waterways Department

TO repair and maintain all electrical machinery in two inland waterway dockyards. To design and prepare estimates for future expansion and set up an electrical repair section. To maintain echo sounding machines, launch refrigeration systems and small h.p. motors and generators used in launches.

Contract appointment in the salary range £1,290 to £1,962 p.a. plus a gratuity of £37 10s. for each 3 months' satisfactory service. Quarters if available at low rental. Free passages for officer and wife, and children up to cost of two adult fares or an allowance of £75 for each of two children maintained in U.K. Free medical and dental treatment.

Candidates, between 28 and 35, must be A.M.I.E.E. or be exempt from the institution's examination. They should have had experience in all classes of installation from estimates to completion of large buildings oil engine standby generating plant. Should have had experience in the repair and maintenance of echo sounding equipment, etc.

Write, stating age, qualifications and experience, to Director of Recruitment, Colonial Office, London, S.W.1. Quote BCD.513/14/03. 7315

SOUTH WALES ELECTRICITY BOARD

TECHNICAL ASSISTANT required at the Board's Head Office for a programme of research on new developments in the use of electricity. Applicants should be able to apply a sound knowledge of physics and mathematics to practical problems, and should hold preferably a degree or equivalent qualification in engineering or physics. An interest in instrumentation and electronics and knowledge of the use of tools for such purposes would be an advantage.

Salary Grade AX/DX 5 (£810/£1,010) of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, to arrive by 24th September, 1957. 7312

SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER (Planning and Development) required at the Headquarters of the West Central Sub-Area of the Board, Fforestfach, Swansea.

Salary Class L, Grade 10 (£995/£1,055) of the N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, to arrive by 16th September, 1957. 7313

CENTRAL ELECTRICITY AUTHORITY

North Eastern Division

ASSISTANT ENGINEER
(Instruments), Steam Testing Department, Stella South P.S.

APPLICATIONS are invited for the appointment of ASSISTANT ENGINEER (Instruments) in the Steam Testing Department with Headquarters at Stella South Power Station, Blaydon.

The successful applicant will be required to assist in the maintenance of all types of instruments and automatic control equipment associated with boilers and turbines in a modern power station.

Applicants should possess a Higher National Certificate or equivalent qualifications.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 12, Class K (£835-£880 per annum).

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 16th September, 1957. 7294

DORMAN LONG (STEEL) LIMITED

Middlesbrough

SYSTEM SHIFT
CONTROL ENGINEERS

are required for an extensive high-voltage network interconnecting several large iron and steel works normally operating in parallel with the public supply.

Applicants should have had experience in the operation and control of H.V. switchgear, turbo-alternators and other rotating plant.

These are staff appointments with membership of the company's superannuation scheme.

Applications, stating age, qualifications, experience and present position, should be forwarded to the Chief Electrical Engineer, Dorman Long (Steel) Ltd., G.P.O. Box 11, Royal Exchange, Middlesbrough, marked "Personal." 7298

ELECTRICIANS

required for
Power Station Contract Work
IN MIDLANDS.

London rates and out allowances paid.
Long-term contract.
Periodical travel facilities home.
Applications to

Employment Manager
JOHNSON & PHILLIPS LTD.
Charlton, London, S.E.7
7080

TRANSFORMER DRAUGHTSMEN

SENIOR and JUNIOR DRAUGHTSMEN with experience on power transformers in range 5 to 10,000 kVA required. Permanent positions offering good salary according to experience. Pension, life assurance scheme, etc. Evening and Saturday interviews can be arranged.

Write stating age, experience and qualifications to:—

Chief Engineer,
BRYCE ELECTRIC CONSTRUCTION CO. LTD.,
Kelvin Works, Hackbridge, Wallington, Surrey.
7317

CENTRAL ELECTRICITY AUTHORITY

Headquarters

APPLICATIONS are invited for the appointment of ENGINEERS in the Reactor Design Sub-Branch of the Nuclear Power Sub-Department at London Headquarters.

Successful applicants will be concerned primarily with work on the overall design and performance of nuclear stations. Primary requirements are a sound practical background of power station engineering coupled with ability to tackle unfamiliar problems. Opportunities will be given for acquiring specialised knowledge as required.

Applicants should preferably hold a university degree and/or be corporate members of one of the senior engineering institutions.

Salaries will be within the scales £1,435-£1,795 p.a. or £1,210-£1,570 p.a., according to experience.

Write for application form to D. Moffat, Director of Establishments, Central Electricity Authority, Applications Section, Winsley Street, London, W.1. Forms to be completed and returned by 21st September, 1957. Quote ref. E.R./375. 7291

CENTRAL ELECTRICITY AUTHORITY

Midlands Division

SECOND ASSISTANT ENGINEER is required in the System Development Section of the Technical Department at Headquarters, Moseley, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 2, commencing at a point commensurate with qualifications and experience within the range £1,145-£1,410 per annum.

Applicants should possess an engineering degree or other qualifications equivalent to Graduate I.E.E., and should have had practical training either in the supply industry or with a switchgear manufacturer. They should also have held a position of responsibility involving transmission system planning, and should have a sound knowledge of the calculations involved, the design and operation of such systems.

Apply, quoting the vacancy number 620MD on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 12th September, 1957. 7167

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for posts as INSTRUMENT MECHANICS, MARCHWOOD GENERATING STATION (NEAR SOUTHAMPTON).

Applicants should have a knowledge of instruments and light fitting work, and previous generating station experience will be an advantage.

Terms and conditions of employment according to the N.J.I.C. Agreement. Rate of pay 4s. 7½d. per hour for 44 hours, 5-day week.

Housing accommodation may be available for successful applicants. Employees may contribute to a voluntary pension scheme after a qualifying period and there is a sick pay scheme. There are canteen and social club facilities.

Applications, giving details of education, training and experience, with dates, should reach the Station Superintendent, Marchwood Generating Station, Marchwood, near Southampton, by Monday, 9th September, 1957. 7268

SOUTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT (Administration) in the Secretary's Office of the Board.

Applicants, who should hold a secretarial or legal qualification, should have administrative experience, including experience of committee work. Knowledge of the electricity industry would be an advantage.

Salary Grades 8 to 9 (£1,145/£1,405) of the National Joint Council (Administrative and Clerical Grades) for the Electricity Supply Industry, the commencing salary being determined according to qualifications and experience.

Applications stating age, present position and salary, qualifications, experience, and three referees, should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, to arrive by 17th September, 1957. 7270

Situations Vacant (continued)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Ayrshire Area

Vacancy: Third Assistant District Engineer, Ardrossan District

APPLICATIONS are invited for the above superannuable appointment from candidates who are Graduates of the I.E.E., or who hold equivalent qualifications, and have had a sound engineering training with experience on distribution systems up to and including 33 kV.

The salary will be within Class F, Grade 9, of the N.J.B. Agreement (£790/£835 p.a.).

A house in Dalry can be made available to the successful applicant.

Applications on the standard form obtainable from any Area Manager should be received not later than 14th September, 1957.

A. E. ROOTS,
Manager.
Greenholm Street,
Kilmarnock.
24th August, 1957. 7304

MIDDLESEX COUNTY COUNCIL

Education Committee

HARROW TECHNICAL COLLEGE
Station Road, Harrow, Middx.

REQUIRED as soon as possible:—ASSISTANT GRADE B in ELECTRICAL ENGINEERING to teach National Certificate classes. A knowledge of electronics or electrical measurements would be an advantage. Industrial and teaching experience desirable.

Salary in accordance with the Burnham (Technical) Report, 1956, i.e., £650 × £25 to £1,025 p.a. plus London allowance, plus training allowances and increments for approved experience.

Application forms (stamped addressed foolscap envelope) from the Principal, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

C. E. GURR, M.Sc., Ph.D.,
Secretary to the Education Committee.
7303

BRUSH ELECTRICAL ENGINEERING CO. LTD., LOUGHBOROUGH

invites applications from qualified engineers for the position of CHIEF DEVELOPMENT ENGINEER in their expanding Switchgear Division.

Responsibilities cover the building and development-testing of all new switchgear and ancillary equipment and general research affecting aspects of switchgear design and application.

Applicants must have completed their National Service and should preferably hold an Honours Degree in Electrical Engineering. Previous experience in the manufacture of switchgear is very desirable.

A good salary will be paid commensurate with the importance of this post. Excellent working conditions include a generous non-contributory superannuation scheme.

Applications giving particulars of past experience and qualifications should be addressed to the Chief Personnel Officer. 7289

FLINTSHIRE TECHNICAL COLLEGE

APPLICATIONS are invited for the position of ASSISTANT LECTURER (Grade B) in Electrical Installation primarily to take classes in Electrical Installation (theory and practice) and Electrical Science up to City and Guilds of London Institute Certificate (Course B).

Applicants should hold suitable qualifications and have had experience in electrical installation work. Previous teaching experience is an added advantage. Salary in accordance with the Burnham Scale (£650 × £25 to £1,025), with starting point dependent on industrial and/or teaching experience.

Further particulars and forms of application, which must be returned by not later than 21st September, 1957, may be obtained from the Registrar, Flintshire Technical College, Connah's Quay, near Chester.

B. HAYDN WILLIAMS,
Director of Education.
7259

LONDON ELECTRICITY BOARD

APPLICATIONS are invited for an appointment as TECHNICAL OFFICER in the Design and Planning Branch of the Chief Engineer's Department in Central London.

Applicants should have had a good technical education in electrical engineering, preferably with a degree. They should have had a sound practical training and preferably be Corporate Members of the Institution of Electrical Engineers.

The commencing salary will be within the appropriate range for Class AX, Grade 4, of Schedule B of the National Joint Board Agreement for Area Boards. The salary range within Class AX is £945 to £1,070 per annum (EX £1,190) inclusive of London allowance.

Applications should be made on forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, which should be returned completed by 9th September, 1957. Please quote ref. PER/2366/R. 7296

CENTRAL ELECTRICITY AUTHORITY

Headquarters, London

APPLICATIONS are invited for the appointment of a THIRD ASSISTANT ENGINEER in the Electrical Section of the Plant Design Branch in London. Duties will be to assist in investigations into design problems associated with electrical equipment for power stations and in the preparation of specifications and examination of tenders.

Candidates should have an engineering degree or equivalent qualifications and some experience in manufacturing design of the rotating electrical machines.

Salary within scale £1,105-£1,315 p.a.

Write for application form to Director of Establishments, Central Electricity Authority, Application Section, Winsley Street, London, W.1. Forms to be completed and returned by 13th September. Quote ref. ER/367. 7245

AIR MINISTRY

WORKS Designs Branch requires in London and Provinces ELECTRICAL ENGINEERING DRAUGHTSMEN experienced in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution, H.V. and M.V. Technical training to O.N.C. standard or equivalent an advantage.

Salaries in London up to £1,015 per annum. Somewhat lower in Provinces. Starting pay dependent on age, qualifications and experience. Long-term possibilities with promotion and pensionable prospects. 5-day week. 3 weeks' 3 days' leave a year. Liability for overseas service. Normally natural-born British subjects.

Write stating age, qualifications, employment details including type of work done, to any Employment Exchange, quoting Order No. Borough 604. 260

PLUMBER - JOINTERS

required for

Contract Work.

To work on cables up to 11 kV.
London rates and allowances paid.
Daily transport from London available for certain contracts if required.
Applications to

Employment Manager
JOHNSON & PHILLIPS LTD.
Charlton, London, S.E.7
7081

SOUTH WALES ELECTRICITY BOARD

ASSISTANT ENGINEER required in District 348 (Cardiff East) in the Central Sub-Area of the Board.

Salary Class E, Grade 9 (£740/£785) of the N.J.B. Schedule.

Applications stating age, present position, present salary, qualifications and experience should be addressed to the Secretary (Establishments Section), St. Mellons, Cardiff, so as to reach him not later than Monday, the 16th September, 1957. 7263

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Board's Northern District at Hackney, London, E.5.

Applicants should have had experience in mains recording with a public utility authority, preferably with an electricity board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £635 to £755 per annum inclusive of London allowance.

Application forms obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed by 14th September, 1957. Please quote ref. PER/2368/R. 7297

PHYSICIST

AUTOMATIC TELEPHONE & ELECTRIC CO. LTD., LIVERPOOL, have a vacancy for a qualified PHYSICIST for their Laboratories at their Main Works at Liverpool.

Candidates should be of graduate standard or equivalent, with reasonable knowledge of chemistry, and the work is on projects involving insulating materials, dielectrics, and applied industrial physics. Some experience in this field is desirable but not essential.

The post will be on the permanent staff with generous contributory pension fund.

Full particulars of age, qualifications and experience should be sent to—

The Personnel Manager
A. T. & E. CO. LTD.
Strowger Works, Liverpool, 7 7300

SALES ENGINEERS

JOHNSON & PHILLIPS invite applications from men with suitable experience for positions as TECHNICAL ENGINEERS to sell one or more of the undermentioned products, principally to industrial and trade purchasers :—

CABLES.
CAPACITORS.
SWITCHGEAR.
TRANSFORMERS.

There are vacancies at Birmingham, Glasgow and Manchester branches.

Applications giving details of qualifications, experience and salary grouping, and indicating the preferred area, should be sent to the Sales Director, c/o Employment Department, Johnson & Phillips Ltd., Victoria Way, Charlton, London, S.E.7. 7192

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

Shift Charge Engineer for Power Plant

APPLICATIONS are invited for the above pensionable staff position. Applicants must have experience in medium pressure water tube boilers and ancillary equipment of a total capacity of 240,000 lb. per hour. Experience with H.T. and L.T. substations, pumps and air compressors is desirable, and a knowledge of water treatment and testing is preferred but is not essential. All applicants must be prepared to undertake shift duties.

Write for application form, quoting reference O9, to Personnel Manager, Metropolitan-Vickers Electrical Co. Ltd., Trafford Park, Manchester, 17. 7162

BRITISH KLOCKNER SWITCHGEAR LIMITED
Chertsey, Surrey

ESTIMATOR for TECHNICAL SALES. Correspondence and capable of preparing control schemes involving automatic motor control gear. Experience essential.

CIRCUIT DIAGRAM DRAUGHTSMAN. Preferably experienced in preparing automatic control gear schemes.

Applicants to have O.N.C. (Electrical). Excellent opportunities with fast growing concern. Pension scheme. Apply to Managing Director, stating experience and present salary. 165

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for the position of DISTRIBUTION ENGINEER for the North Caledonia Area, centred at Elgin, Morayshire.

Salary per Scale 2 of N.J.M. Agreement with placing in accordance with qualifications and experience. Superannuation scheme applicable. House available.

Application form, available from Area Manager, West Villa, Elgin, should be returned by 16th September, 1957. 7306

ELECTRICAL CONTROL OPERATORS

required for shift work in modern industrial generating station. Applicants must have power house experience, including load control and the necessary switching operations, and preferably also in parallel working with National Grid System.

Most attractive rates of pay and conditions of service.

Applications in writing giving age, qualifications and experience to the Labour Manager, THE CLAYTON ANILINE COMPANY Ltd., Clayton, Manchester, 11. 7161

MANAGER FOR ELECTRICAL CONTRACTORS

ELECTRICAL contractors require MANAGER for service in the Persian Gulf. Salary will not be less than £2,500 per annum in addition to overseas allowance.

Applicants should have drive, sound technical training and very considerable experience of electrical contracting.

Age approximately 30-35 years and ability to meet clients at the highest level. A two-year contract with opportunity of renewal after leave in U.K.—Box 7292.

A VACANCY exists in the Yorkshire area for an experienced cable sales engineer who will be based on Leeds. Applicants should have a good knowledge of rubber and thermoplastic cables, hold appropriate technical qualifications, and preferably should have contacts in the territory. The appointment is pensionable and offers scope for advancement. Write stating age, education, qualifications and experience to the Sales Manager, Mersey Cable Works Ltd., Linacre Lane, Liverpool, 20. 7283

ADMIRALTY require technical officer (electrical) for unestablished post in London. Candidates must have served apprenticeship or equivalent in electrical engineering plus 2 years as a craftsman. O.N.C. or equivalent an advantage. Duties include preparation of spares schedules and arranging the scale of provision of spares, tools, test and maintenance equipment for electrical and electronic aspects of air armament, including guided weapon systems; assistance in setting-up and running of defect investigation and modification procedures. Salary according to age and experience within range for Technical Class Grade III, £695-£870, 5-day week, 18 days' annual leave. Apply with details of age, qualifications and experience to Admiralty, C.E. II (114), Empire Hotel, Bath. 7277

ARMATURE winder required with ability to supervise small repair shop. N.E. London area.—Box 7318.

ASSISTANT electrical engineer and electrical draughtsman required for electrical installations in buildings. Engineer should possess H.N.C., draughtsman O.N.C. Consulting engineers' office, Victoria Street, London.—Box 9096.

ASSISTANT for design of electric motors and generators with National Certificate in Electrical Engineering or equivalent. Progressive position.—Higgs Motors Ltd., Witton, Birmingham. 7212

ASSISTANT technical manager required by company engaged in the manufacture of rubber and thermoplastic cables. Applicants should preferably be graduates in electrical engineering or physics or hold equivalent qualifications, and should have previous experience in the electrical cable industry. Applications, giving age, qualifications, experience and salary required, to be addressed to Personnel Officer, St. Helens Cable & Rubber Co. Ltd., Trading Estate, Slough, Bucks. 7271

CHARGEHANDS required for installation work by large company of London electrical contractors.—Box 7247.

CABLE company requires technical engineer for super-tension cable schemes development. Knowledge of oil-filled cables an advantage and must be able to formulate detailed technical instructions. Applicants should have technical qualifications of at least H.N.C. standard in electrical engineering. Apply—Box 7246.

CHIEF electrical estimator required for small manufacturing concern in N. London dealing with interesting and varying range of electro-mechanical and sheet metal projects. Details to—Box 7163.

CHIEF engineer required to supervise the electrical and mechanical services of the newly constructed John Lewis building in Oxford Street, which will contain about £500,000 worth of modern engineering equipment. Responsibilities will include detailed knowledge of the working of such machinery and the ability to estimate for spares, replacements and major maintenance, as well as the carrying out, with own staff, of all day-to-day maintenance work. Pay not less than £1,000 a year. Profit sharing and non-contributory pension. Write, giving full details of age, qualifications and experience to—Director of Personnel, John Lewis & Co. Ltd., Oxford Street, London, W.1. 7257

CIRCUIT draughtsmen required by firm manufacturing industrial control equipment. Commencing salaries up to £800 per annum for first-class men, but some less experienced draughtsmen required. Canteen facilities, pension scheme, holiday commitments recognised. Housing assistance later to approved cases. West Middlesex area. Write giving age, experience and full details to Box 7125.

C.M.A. cable manufacturer requires sales representative for the Birmingham and Midlands area. One with established connections preferred. Write in confidence giving full details. Own staff informed.—Box 7150.

COMMERCIAL assistant required for the lighting division of a company marketing a good range of lighting fittings and accessories. The candidates should be between 25/35 years of age, with experience of commercial correspondence, enquiries and quotations. Some knowledge of wiring and sheet metal work is an advantage. The post is pensionable and offers a salary in accordance with age and experience. Applications should be addressed in confidence to the Employment Officer, Philips Electrical Limited, Century House, Shaftesbury Avenue, London, W.C.2, quoting ref. 129. 7251

DESIGNER required for large power transformers up to 45 MVA at 132 kV. Good pension scheme and prospects in an expanding organisation. Reply giving details of experience, age and salary required to—Box 7195.

DRAUGHTSMEN. Excellent opportunities offered to electrical/mechanical draughtsmen. Established expanding company specialising in contactors, control panels and test rigs. 37½-hour week, two weeks' paid holiday after 10 months and sickness scheme. Write giving full details and salary expected.—Box 7211.

DRAWING office of London manufacturers offers £1,000 per annum starting salary to senior draughtsman who is well acquainted with motors, generators, alternators, rotary converters and rotary transformers up to about 15 kW. Good conditions, superannuation scheme and canteen. Permanent position. Write—Box 7250.

EAST Africa. Supervising engineer required for leading electrical contractor. Must be experienced in estimating and design of electrical installations. Write stating age and experience.—Box 7172.

ELECTRIC repair and winding shop require fully experienced and ambitious man view taking charge of small works. Directorship available.—Box 7320.

ELECTRICAL designer in charge small drawing office dealing with many aspects of design and application of medium switchgear, busbar systems, control boards, etc. This is unquestionably an important appointment for initiative and creative thinking in a small expanding manufacturing unit N. London. State details, approx. salary to—Box 7164.

ELECTRICAL engineer, male, fully qualified and with experience in maintenance and new work installation and instrumentation, required by Morgan Refractories Ltd., Liverpool Rd., Neston, Wirral. 5-day week, canteen, pension scheme. Application forms from the Staff Manager. 7256

ELECTRICAL engineer required for design office for well-established company manufacturing electrical rotating machinery. Sound technical and good practical knowledge essential. Apply in writing to — Chief Designer, Laurence, Scott & Electromotors Ltd., Openshaw, Manchester, 11. 7284

ELECTRICAL engineers for junior posts are required for experimental work on traction auxiliary motors and electro-pneumatic control schemes and equipment. There are possibilities of advancement for those who have obtained O.N.C. or reached S2 standard, and had some practical experience. Age limit 26. Write for further details to Personnel Superintendent, Westinghouse Brake & Signal Co., Ltd., Chippenham, Wilts, quoting ref. no. EQUIP/N/A1. 7127

ELECTRICAL. First-class engineers, foremen and chargehands required by large London firm electrical engineers and contractors. Progressive positions. Write age, experience, references, etc.—Box 7068.

ELECTRICAL installation draughtsmen for design of lighting and power schemes for all types of buildings required for consulting engineer's office in Reading/Oxford area. Appointments carry good salaries and pension scheme. Apply in writing giving full details of previous experience and technical qualifications to—C. W. Glover & Partners, Francis House, Francis Street, London, S.W.1. 7174

ELECTRICAL sales engineer required for London and Home Counties. Experienced man preferred but consideration given to representative with genuine urge to sell motors and control gear. Write stating full particulars to—Box 7274.

ELECTRICAL supervisor required for building installations in Aden. Salary £1,200/£1,500 plus allowances. Eighteen months' contract. Bachelor preferred. Must have electrical experience.—Box 7198.

ELECTRICAL wholesalers require experienced representative for Birmingham area. Excellent opportunity for man with established connections. Car provided and remuneration will be by salary, commission and expenses. Replies giving full details treated in strict confidence to—Box 7285.

ELECTRICIANS, London rates.—Leonard J. Ive, 29, Clarendon Road, Watford 'Phone 4030). 9070

ESTIMATING. E. K. Cole Limited, Malmesbury, Wilts, have a vacancy for an estimator. The company is engaged on electronic equipment, and applicants should have had a wide experience in estimating this class of work and small quantity production. Good practical shop training is considered essential and an engineering apprenticeship desirable. Good salary will be offered and there is a possibility of housing accommodation being available to suitable applicants. Full welfare facilities and contributory pension scheme. Please apply in writing with details of education, training and experience to—Personnel Manager. 7276

EXPERIENCED meter designer required by Chamberlain & Hookham Ltd., Birmingham, 5. Written applications giving all details of electrical and mechanical design experience, age and technical status will receive careful consideration. An appropriate offer will be made to suitable candidates. 9066

FITTER assembler for small elec. repair shop, experienced small and domestic type motors.—Box 7319.

FURTHER expansion at Birlec Limited, Tyburn Road, Birmingham, 24. Required urgently. Electrical engineers for engineering design departments to handle a wide range of electrical plant, associated with electric furnaces. The work includes application engineering, circuit design, preparation of specifications and technical correspondence. Engineers with good technical training should apply at once, minimum qualification acceptable for junior positions being O.N.C. Electrical Engineering with continuation of study for H.N.C. These positions offer good prospects in an extremely interesting field of electrical engineering involving electrical plant for L.T. and H.T. systems with furnace loads up to 50 MVA at 132 kV. Apply in writing to—Personnel Manager (WLH). 7321

JOINTER, first-class cable, fully experienced H.T. and telephone work, required by large London firm electrical engineers. Excellent opportunity. Write experience, references.—Box 7248.

***Situations Vacant** (continued)*

GENERAL superintendent (European) required for large well-established British-owned factory in Calcutta manufacturing a wide range of electric motors, transformers, switchgear, etc. Must have had considerable experience in charge of shops producing similar equipment. Knowledge of latest manufacturing methods and processes, and ability to organise operations for fast and economical production essential. The man appointed will be required to plan and instal an efficient piecework system in the factory where only day-work has been in operation up to the present, and good experience of the introduction and operation of piecework systems is essential. Age 30 - 40. Salary before tax, including dearness allowance, 3,300 rupees per month, plus travelling expenses, free passage to India, including wife and family, free accommodation and medical attention. Appointment will be subject to a 3-year renewable contract. Reply with names of references to Secretary, A.E.I. Overseas Ltd., Crown House, Aldwych, London, W.C.2. All applications will be treated in confidence. 7203

GREENGATE & IRWELL RUBBER Co. Ltd. require a representative to sell C.M.A. cables in London and Home Counties. Previous experience in the area and suitable technical knowledge highly desirable. Remuneration by salary and commission. Superannuation fund. Applications to — Personnel Officer, Greengate Works, Manchester, 3. 7280

JUNIOR engineers required for the supervising of cable installation contracts throughout the country. Applicants must be capable of controlling rough labour and jointing staff, and taking as laid sketches to customers' requirements. Apply—Box 7230.

MACHINE shop superintendent required by large British-owned electrical engineering company's manufacturing plant in India. Applicants should be between ages of 30 and 40 years and have served a machine shop craft apprenticeship with subsequent experience in machining medium-sized products on batch production. Applicants should have risen to foreman or potential foreman status and be able to demonstrate machine tools and train labour. Experience of blanking presses, electro-plating and light non-ferrous casting desirable but not essential. The appointment is a senior one, would be for 3 years in the first instance, with passage, accommodation, medical expenses for self and family provided free. The gross salary before tax would be in the range of 1,800 and 2,250 rupees per month depending on age and experience. The appointment is pensionable. Full details should be sent to the Secretary, A.E.I. Overseas Ltd., Crown House, Aldwych, London, W.C.2. 7151

MANAGER assistant, 25-35 years, required by electrical contractor (med. size) engaged on building installations to handle all internal technical and office procedures. Good draughtsman able prepare schematic layouts and experienced estimating, buying, etc. Pension scheme. Excellent opportunity. State age, experience and salary required.—Box 7231.

MERZ & McLELLAN have vacancies in their Esher office for electrical engineering draughtsmen, preferably between the ages of 25 and 32. Applicants should be experienced in plant layout work, cabling, etc., and experience of steam power station practice would be an advantage but is not essential. Salaries will be fully appropriate to applicants' experience, rising from about £780 per annum at age 25. Excellent working conditions. Five-day week. Pension scheme. Canteen. Apply in writing to Merz & McLellan, Milburn, Esher, Surrey. 7206

OVERHEAD linesmen required for wood pole H.T. and L.V. overhead lines in North East England. Permanency for conscientious men. Overtime and country allowance where applicable. Write giving particulars of experience, etc.—Graham Bros. (Electrical Engineers) Ltd., Zetland Place, Middlesbrough. 7236

POWER house superintendent required by the Baghdad Electricity Services for steam power station, medium pressure, 41 MW installed capacity, Babcock boilers and Parsons turbo-alternators. Three years' initial contract. Three months' leave after twenty-four months in Iraq. First class passage paid for successful applicant and family. Salary Iraqi Dinars 170 per month plus high cost-of-living allowance I.D. 22 to 25 according to number in family. Free house and heavy furniture provided. Age 35 to 45 years. Provident fund exists.—Box 7156.

PORT OF LONDON AUTHORITY invite applications for the position of assistant engineering inspector (electrical) on their established pensionable staff. The scale of pay, inclusive of pay supplement, is £731 5s. rising by two annual increments to the maximum of £787 10s. per annum. Applicants, who should be under 50 years of age, are required to possess sound knowledge of the principles concerning both high-voltage and low-voltage distribution, including switchgear, transformers, cables, pumps, rectifiers, and associate protection, and automatic controls. Experience in the control and management of labour is desirable. Applications giving age and full details of experience should be addressed to the Establishment Officer, Port of London Authority, Trinity Square, London, E.C.3. 7272

QUALIFIED engineer or engineering designer/draughtsman required to be trained as assistant chief draughtsman in a neon sign and light engineering factory. When replying please give details of qualifications, experience, age and salary required to — Claude-General Neon Lights Ltd., Wembley Hill Estate, Wembley. 7275

SALES engineer with good appearance and qualifications is offered a permanent position with increasing scope, good salary, according to age and experience, and pension scheme. Help with housing. Sound knowledge required of transformers and regulators. Apply Sales Director, Brentford Transformers Ltd., Crawley, Sussex. 7153

SALES manager required. Must have knowledge of overhead transmission equipment and connection with the Area Boards. Good permanent and progressive opening for young man under 40. Write in first instance—Bowthorpe Electric Co. Ltd., Crawley, Sussex, addressed to Sales Director. 7165

SALES representative reqd. by manufacturers of electrical switches and accessories for London and Home Counties. Good salary and expenses. Own staff advised.—Box 7273.

STOCK control operator and order clerk required. Both posts are senior, well-paid positions offering scope in the future. Superannuation scheme, canteen and social club facilities. Experience of electrical wholesaling essential. Apply to Managing Director, Halsey's Electric Co. Ltd., Brandon House, Wyfold Rd., London, S.W.6 (Fulham 3355). 7052

SUPERINTENDENT engineer required for the Baghdad Electricity Services. Application invited from qualified engineers for new 8-MW diesel plant. Previous experience in similar position required. Monthly salary I.D. 150 plus high cost-of-living at present I.D. 20 per month. Passage paid first class, including wife and children under 16. Free house with heavy furniture. 3 months' vacation home on full pay after 2 consecutive summers in Iraq. Provident fund exists. Age limit 40.—Box 7157.

SUPERVISING engineer with estimating experience required by electrical contractors. 5-day week and superannuation scheme. Apply in writing stating experience and salary required. —Marryat & Place Ltd., 40, Hatton Garden, London. E.C.1. 7038

SWITCHGEAR sales engineer (inside) required to deal with enquiries and orders for a wide range of substation and power station switchgear. Applicants should have a fair knowledge of switchgear requirements and should state their technical qualifications and practical experience. Apply in first instance to the Personnel Officer, Ferguson Pailin Ltd., Higher Openshaw, Manchester, 11. 7249

TRANSFORMER dept. superintendent required by large British-owned electrical engineering company's manufacturing plant in India. Applicants should be between the ages of 30 and 40 years and have served an electrical engineering craft apprenticeship with subsequent experience of all aspects of the manufacture of distribution and power transformers in the range of 50 kVA to 2,500 kVA and up to 33 kV. Applicants must be thoroughly conversant with modern methods and have reached at least the position of foreman on similar work, and be able to demonstrate and train labour. The appointment is a senior one, would be for 3 years in the first instance, with passage, accommodation, medical expenses for self and family provided free. The gross salary before tax would be in the range of 1,800 to 2,250 rupees per month, including cost-of-living allowance, depending on age and experience. The appointment is pensionable. Full details should be sent to the Secretary, A.E.I. Overseas Ltd., Crown House, Aldwych, London, W.C.2. 7152

TECHNICAL assistant required with H.N.C. or degree in physics or electrical engineering, to deal with various aspects of development of power capacitors and the use of a surge-generator of 1½ M. volts. The post also provides a good opportunity for experience in the high-voltage field in connection with the testing of power transformers up to 15,000 kVA. Apply in writing in the first place to—Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Wallington, Surrey. 7278

TECHNICAL assistants (one senior, one junior) for the preparation of lighting schemes, illuminating engineering dept., old-established mfrs. of lighting equipment. 5-day week. Pension fund. State age and experience. —Chief Engineer, Technical Service Dept., Holophane Ltd., Elverton St., Westminster, London, S.W.1. 7183

TECHNICAL journalist. Metropolitan-Vickers requires assistant with technical background and some journalistic experience for press liaison work in publicity department (at Trafford Park, Manchester). Principal duties would be to collect and/or edit information for issue to the technical press, but some semi-technical or popular writing may also be required. The company's activities cover a wide range of mechanical and electrical engineering. Write giving details of education, training, experience, age, present position and salary to the Manager, Publicity Department, Metropolitan-Vickers Electrical Co. Ltd., Mosley Road Works, Trafford Park, Manchester, 17. 7154

THE REVO ELECTRIC Company Limited require a sales engineer at their head office near Dudley for special work on the promotion of sales of lighting and industrial equipment. Applications are invited from men of good education, aged 30-35, with technical and commercial experience in the lighting industry and knowledge of lighting technology. The position is pensionable and offers good prospects. Apply in writing to the Sales Manager, Industrial Division, Revo Electric Co. Ltd., Tipton, Staffs, stating previous experience and salary required. 7279

TRANSFORMER designer for all types up to 750 kVA. Good commencing salary, and if required help with housing could be arranged. Growing company near London. Our Staff have been informed of this advert. —Box 7281.

TRANSFORMER designer (senior) required. Applicant must have wide experience in design and manufacture of units up to 250 kVA. Promotion to directorship offered after qualifying period with commensurate salary and bonus. Housing accommodation if required. Replies will be treated in strict confidence.—Stewart Transformers Ltd., 75, Kilburn Lane, London. W.10. 7238

TRANSFORMERS & RECTIFIERS Ltd., Millmead, Guildford, Surrey, require a designer for units up to 500 kVA. An excellent opportunity exists for a man who is looking for a situation with really good prospects in an expanding business. Applicant with a good general knowledge may eventually also undertake rectifier work. Housing assistance. Good salary. Reply in confidence. 7282

TRINIDAD, British West Indies. Young electrical engineer required by commercial company (representing Metro-Vick) in its engineering sales department to promote sales of electrical and mechanical equipment to oil, sugar and industrial companies. Interesting appointment for man who, in addition to his technical knowledge, is sales minded. Write in confidence to—Neal & Massy Engineering Company, P.O. Box 544, Port-of-Spain. 7322

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

LESLIE MAYNARD Ltd. — Storekeeper. All applicants are thanked.

SITUATIONS WANTED

CHARTERED electrical and mechanical engineer with 18 years' executive experience out East desires position as overseas representative, travelling representative, export manager or contracts manager. Available early September.—Box 9068.

EASTERN Counties. Young middle-aged experienced representative, good connections all aspects electrical trade, seeks position with firm of repute.—Box 9099.

ELECTRICAL engineer, B.Sc., A.M.I.E.E., holding senior project situation, London, seeks position N. Somerset/Bristol area. Experienced design, contract, installation, etc., large industrial distribution, power, light, heat, vent. schemes.—Box 9083.

ENGINEER, M.I.E.E., retired (55), desires appointment. Managerial, personnel, welfare or technical representative. Background, works engineer large industrial concern/work study administration 8 years. Dorset or adjoining counties desirable.—Box 9082.

EXPERIENCED estimator-supervisor power inst., etc., seeks permanent position. Excellent contacts.—Box 9097.

FOREMAN/supervisor electrician (34) seeks employment September anywhere in U.K. 18 years' experience factory maintenance and installation, engineering and plastics industries. Capable preparing layouts, etc. Present location Midlands. Refs. available.—Box 9090.

KEEN representative, age 40, 11 years' trade experience, desires change, London/Eastern Counties, manufacturer or wholesaler.—Box 9085

QUALIFIED elect./mech. engineer (47). Experienced chief engr. and works manager. Rotary machy., swgr., elect. appliances, fabrication, foundry. Pres. loc. Essex/London. —Box 9075.

SALES engineer, long experience in domestic apparatus, seeks position in Scotland or N.E. England. Managerial position at present time on salary of £1,350 p.a.—Box 9076.

SALES representative. Advertiser, of smart appearance with own car, seeks position of trust and responsibility with a manufacturer requiring a keen go ahead representative in the Midlands. 30 years' outdoor sales experience in the electrical trade (the past 19 years with leading E.L.M.A. manufacturer in Birmingham), contacts with electrical wholesalers, large works users, borough engineers and M.E.B. offices; used to working on initiative at top levels. Owing to amalgamation now seeks position elsewhere, where connections and contacts would be of service.—Box 9100.

SERVICE engineer, proficient in telephone and clock equipment, at present residing in Northants, requires post in Northants or Leicestershire. Willing learn other equipment. —Box 9073.

ARTICLES FOR SALE

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KETTERING POWER STATION

STIRLING Boiler and Superheater, 30 k/lb/hr. at 200 lb. p.s.i., 750° F.; BRUSH LJUNGSTROM T/A and Condenser, 1,266 kW, 3,000 r.p.m.; BRUSH LJUNGSTROM T/A and Condenser, 2,500 kVA, 3,000 r.p.m.; together with Coal Elevators; I/D Chimney and Fan, Grit Extractor; Ash Hoists; Economisers; various Pumps; Storage Tanks; Water and Steam Piping; Steam Receivers; Feed Heater; Coal Loader; 3 Timber Cooling Towers; 2 Water Softeners; 160-ft. Brick Chimney Stack; Step-up Transformer, 1,250 kVA, 637/6,800 v.; 2 Electric Battery Vehicles (3½-ton and 5-ton capacity) plus various spares, motors, etc.

LOUGHBOROUGH POWER STATION

Demolition and removal of one Brick Chimney Stack, 135 ft. approx. high and approx. 6 ft. diameter inside at top.

NOTTINGHAM POWER STATION

(1) For sale, Supporting Steelwork to Ash Pipeline and Reclaiming Conveyor.

(2) Dismantling, and putting to our storage, Ash Piping and other plant.

Tender forms and arrangements to view obtainable on request from—

Divisional Purchasing Officer
CENTRAL ELECTRICITY AUTHORITY
East Midlands Division
P.O. Box No. 25, Barker Gate, Nottingham
(Telephone 46151, ext. 78)
7252

CLASSIFIED ADVERTISEMENTS ARE PREPAID

DIESEL ALTERNATOR SETS

400/440 volts, 3-phase, 50 cycles

500-kVA PETTER "SS" vertical 6-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

250-kVA PETTER "SS" vertical 3-cyl. water cooled Engine. Comp. air start. BRUSH Alternator. Auxiliaries, control gear, etc. 600 r.p.m.

187-kVA WAUKESHA vertical 6-cyl. radiator cooled Engine. Eng. start. G.E.C. Alternator. Control gear. 1,000 r.p.m.

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149-kVA RUSTON vertical 5-cyl. water cooled Engine. Comp. air start. L.D.C. Alternator, control gear. 600 r.p.m.

100-kVA MIRRLEES vertical 3-cyl. water cooled Engine. Comp. air start. G.E.C. Alternator, control gear. 600 r.p.m.

93.5-kVA BLACKSTONE vertical 3-cyl. water cooled Engine. Comp. air start. E.C.C. Alternator, control gear. 600 r.p.m.

68.8-kVA CROSSLEY vertical 6-cyl. water cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear. 1,000 r.p.m.

62.5-kVA McLAREN vertical 5-cyl. radiator cooled engine. Elec. start. BRUCE PEEBLES Alternator, control gear. 1,000 r.p.m.

62.5-kVA PERKINS vertical 6-cyl. radiator cooled Engine. Elec. start. METRO-VICK Alternator, control gear. 1,500 r.p.m.

58-kVA FOWLER vertical 6-cyl. radiator cooled engine. Elec. start. L.D.C. Alternator, control gear. 1,500 r.p.m.

37-kVA PERKINS vertical 6-cyl. radiator cooled Engine. Elec. start. HIGGS Alternator, control gear. 1,500 r.p.m.

27-kVA CROSSLEY vertical 3-cyl. radiator cooled engine. Hand start. CROM-PARK. Alternator, control gear. 1,000 r.p.m.

20-kVA LISTER vertical 3-cyl. radiator cooled Engine. Hand start. CROM-PARK. Alternator, control gear. 1,000 r.p.m.

14-kVA NATIONAL vertical 2-cyl. radiator cooled Engine. Hand start. B.T.H. Alternator, control gear. 1,000 r.p.m.

THOS. W. WARD LTD.
Albion Works, Sheffield
(Phone 26311, ext. 347; Grams, Forward).
322

COUNTY BOROUGH OF SWANSEA

Swansea Technical College

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TENDERS are invited for the above, which includes Rotary Converter, Motor Compounds, Motor Alternator Set, Shunt Motors, Induction Motors, etc., some of which are in running order. No guarantee is given on the operating efficiency of any of the equipment.

The machines can be inspected by arrangement at the Swansea Technical College, Mount Pleasant, Swansea.

Tenders to be submitted on the official form and specification obtainable from the Borough Architect, The Guildhall, Swansea, and shall be forwarded by registered post (or delivered in exchange for a receipt) in the envelope supplied, which shall bear no name or mark indicating the sender, so as to reach the Town Clerk, The Guildhall, Swansea, not later than Friday, the 20th September, 1957.

The Corporation does not bind itself to accept the highest or any tender.

T. B. BOWEN,
The Guildhall, Town Clerk.
Swansea.
23rd August, 1957. 7286

UNUSED D.C. GENERATORS
(for Prompt Despatch)

QUANTITY of 24-kW and 15-kW compound wound 100-volt D.C. Generators by L.D.C., E.C.C. and E.E.C.; drip-proof frames with endshield ball/roller bearings; various speeds between 1,440 and 1,625 r.p.m.

30-kW compound wound D.C. generators by MAWDSLEY, drip-proof frames; 1,100 r.p.m.; with endshield ball/roller bearings; 230 volts.

GEORGE COHEN SONS & CO. LTD.
Wood Lane, London, W.12
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ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

ABABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- Slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-100 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

ALUMINIUM, brass and copper in sheets, rods, tubes, angles, etc. Sheared blanks a speciality. Approved stockholders. For immediate attention, phone or send your inquiries—R.D.C., 100, Hamstead Rd., London, N.W.1 (EUSton 5176/7). 352

AUTO transformer starters, all 400-440/3/50, oil immersed; 150 h.p., Allen West; 4 off 95 h.p., Erskine Heap; 75 h.p., Allen West; 60 h.p., A. West; 50 h.p., Metro-Vick.; 65½ amp., Ellison; 50 h.p., Ellison; 45 h.p., A. West; 49½ amp., Ellison; 40 h.p., A. West; 3 off 44 amp., Ellison; 27 h.p., A. West; 3 off 15 h.p., Erskine Heap.—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley (3774/5/6). 68

BARGAINS in electric motors are always being obtained from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Stocks include A.C. and D.C. motors, second-hand and new up to 30 h.p. Starters, slide rails and pulleys. Ring Mon. 3355 for your requirements. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

BRAND new and unused Evershed & Vignoles series 1 bridge Megger testing set, Cat. No. 35059. Testing 1,000 volts, range 0/100 megohms, with 4-dial resistance box adiustable 1/9999 ohms. To-day's list price £189 10s. Offered with immediate delivery at the unrepeatable sum of £120 net.—J. H. Elsby, Market St. West, Birkenhead (Tel. 3192). 7178

BRUCE Peebles 250-h.p. synchronous motor, 400 volts, 3-phase, 50 cycles, 1,500 r.p.m., complete with George Ellison starter.—Whitefield Machinery & Plant Limited, Cobden St., Salford, 6 (Tel. PEN. 4746). 303

CABLE, underground, all types ex stock.—E. M. Tatton Co. Ltd., Kew Bridge, Brentford (Ealing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, 110 and 220 v. D.C./230 v. A.C., .5 to 6 kVA; also A.C./D.C. Special voltages at short notice.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

Articles for Sale (continued)

DISPERSIVE reflectors, green enamel with white interior, 60, 100, 300 and 500-watt sizes available. Cheap, in lots of one dozen. —Leighton Warehouse Company, 6, Church Road, Linslade, Leighton Buzzard (Tel. L.B. 3400). 9092

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

ELSBY for most types and sizes of Niphan, L & P, and similar pattern watertight plugs, sockets, switches, switchplugs, etc.—J. H. Elsby, Market St. West, Birkenhead (Tel. 3192). 7179

FLOODLIGHTS, Simplex weatherproof, 500/1,500 watts, swivel-mounted, new, 50 available, cheap to clear. 100 Maxlume weatherproof 200-watt floodlights, swivel-mounted available. 50 Simplex shovel-type floodlights for pole-clamp mounting.—Leighton Warehouse Company, 6, Church Road, Linslade, Leighton Buzzard (Tel. L.B. 3400). 9091

FLUORESCENT fittings, lamps, starters and contol gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FRACTIONAL h.p. motors, new, ex stock, A.C./D.C., Universal, B.T.H., Delco-Remy, G.E.C., Fracmo, Newman, Scophony. — Jeary Electrical Co. Ltd., 5, Lamb's Buildings, London, E.C.1. 126

GENERATING plants, remote and M/F up to 10 kVA; also secondhand A.C. and D.C. sets up to 100 kVA, large stock all types. Special plants built at short notice.—Powerco Ltd., 312, York Road, London, S.W.18 (Tel. VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW. A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station works, Bishop's Stortford. 161

HOUSE service meters, C. & H., Aron, E.A.C., 20-240 v. A.C., s.-ph., 50 c., 2½ amps., 7s. 6d. each, 1s. 6d. postage; 5 amps., 17s. 6d. — Universal Electrical, 217-221, City Road, London, E.C.1. 37

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTORS, starters, circuit breakers. Large stock of all types, ¼ to 30 h.p., new or reconditioned, for immediate delivery. Stock list or quot'n by return.—J. S. Ramsbottom & Co. Ltd., Elec. Engs., Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

ONE 100-kW, A.C. Hercules model D.N.X. diesel engine generating set, self-contained, semi-portable, skid mounted and enclosed with combination voltage of 120, 220 and 400; also combination 50 cycles at 1,500 r.p.m. and 60 cycles at 1,800 r.p.m.—Wood, Rozelaar & Wilkes Ltd., Chase House, North Acton Rd., London, N.W.10. 7323

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLASTIC bell shades, 6" with 1⅛" hole, 5,000 available at 15s. dozen.—Leighton Warehouse Company, 6, Church Rd., Linslade, Leighton Buzzard (Tel. L.B. 3400). 9093

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. or D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switch-holder incorporated is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each subject. — F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY Credit Meters, single & poly-phase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

ROTARY converters in stock, all sizes: enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

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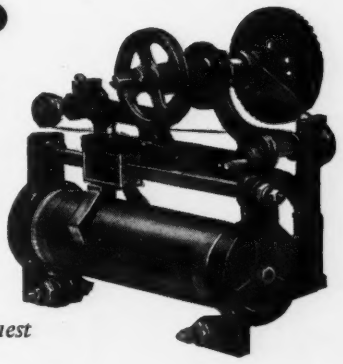

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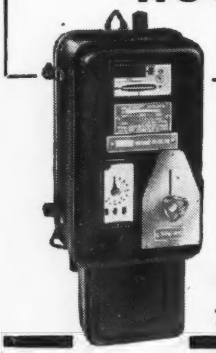

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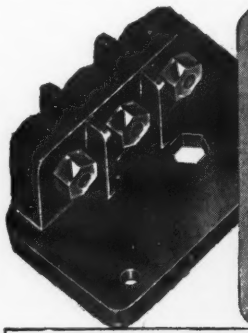

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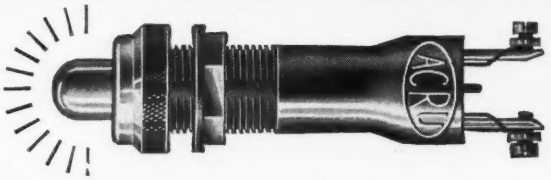

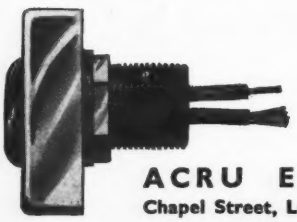

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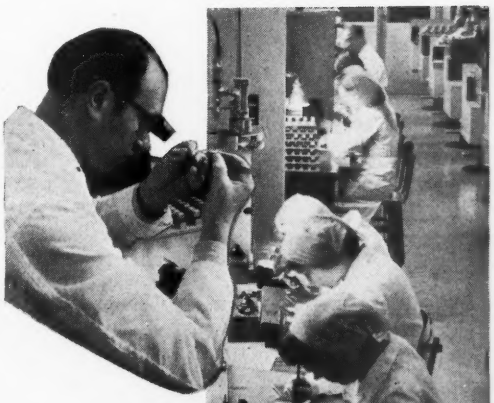

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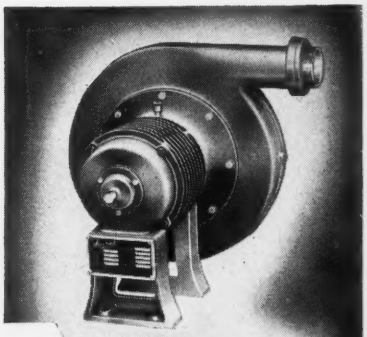

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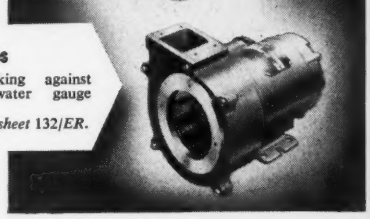

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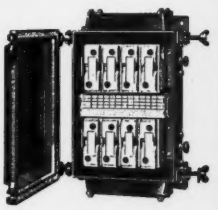

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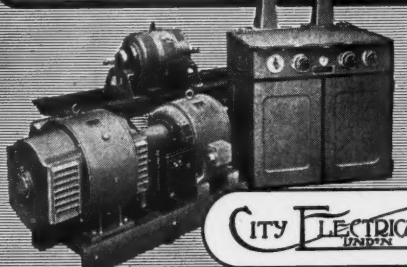

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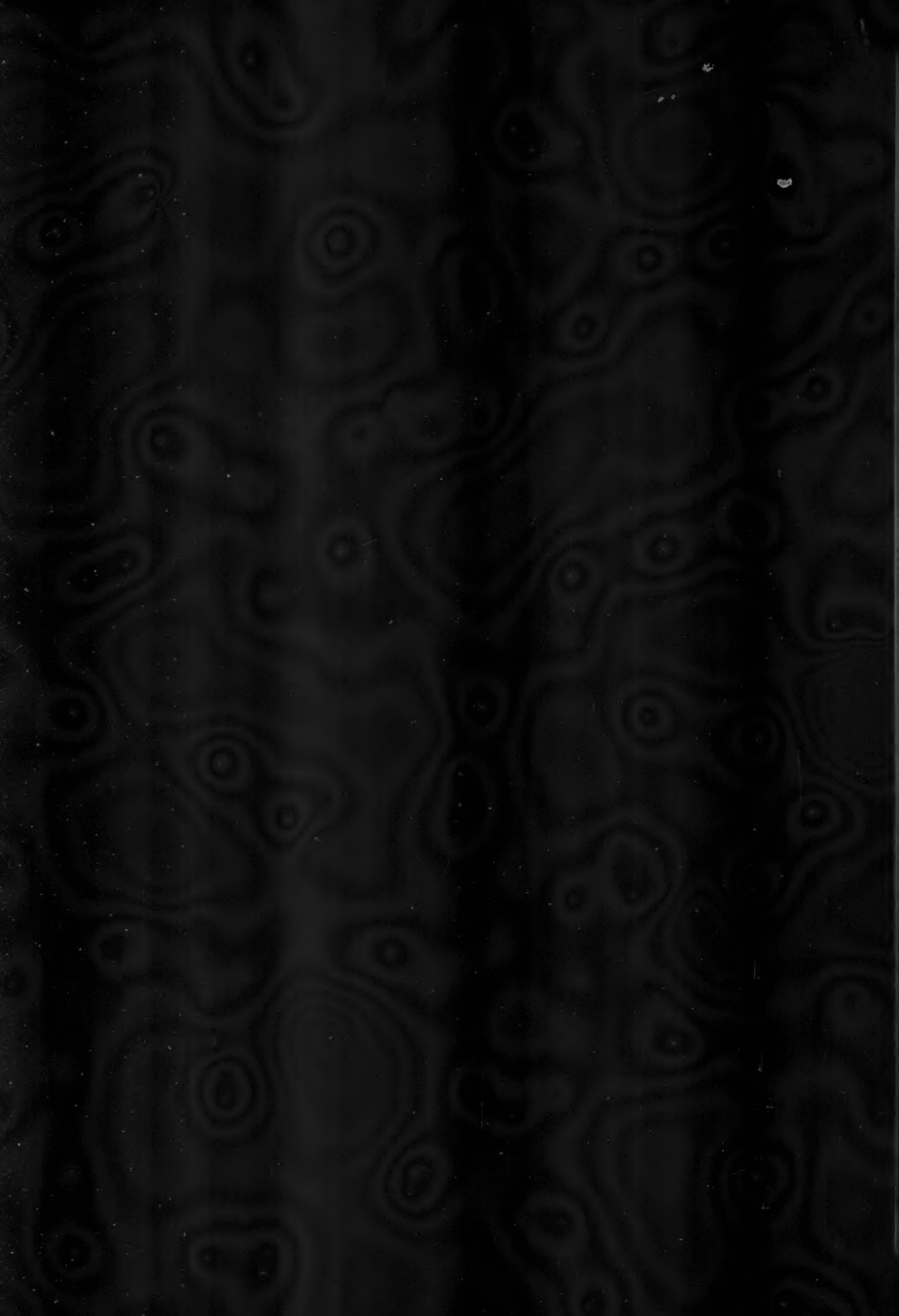

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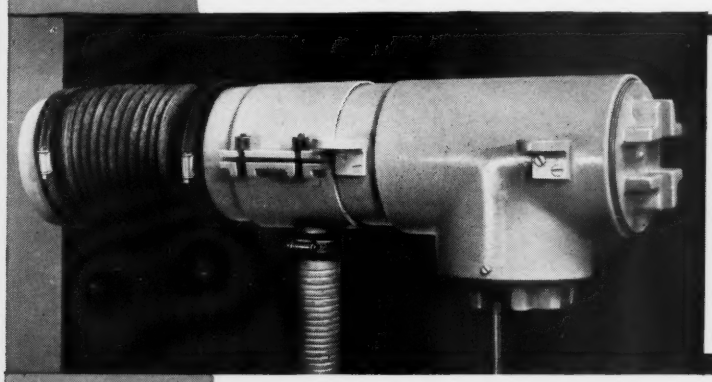

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